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ABSTRACT

Part 1 of this teacher's guide contains job descriptions, teaching suggestions/answers, and worksheets for twenty careers and classroom experiences which are designed to be used in teaching science. The following twenty careers are covered: meteorologist, geologist, musical instrument maker/repairman, opthalmologist, astronomer, paint chemist, mechanical engineer, psychologist, computer programmer, anthropologist, electrician, city planner, auto repairman, sociologist, microbiologist, agronomist, food chemist, paleontologist, marine engineer, and physicist. Part 2 provides instructions and worksheets for twenty puzzles which are based on general science careers. (BM)

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20 Careers and Classroom Experiences for Teaching Science

Includes: Job Descriptions
Teaching Suggestions & Answers
Work sheets

Prepared by Greg Ondrake

CE 017 137

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
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THE JOB OF METEOROLOGIST

Tries to predict or forecast the weather--both immediate and long range.

Studies the air pressure, temperature, humidity, wind speed, and precipitation.

Tries to understand the effects of the sun, dust in the air, high level winds, and ocean currents on long range forecasting.

Draws weather maps, showing rainfall, temperature, and air pressure.

Tries to predict the movement of the rainfall, the cold and warm air, and the storms.

Advises airplane pilots on storms, winds, ice, visibility and other conditions that might affect their flying.

Specific training for the job: four to six years of college.
(not for TV announcer)

Interests: scientific and technical work; abstract and creative work.

Temperaments: likes planning the whole job.
likes making judgments based on numerical data.
likes making judgments based on what he sees.

Salary: $8,000 - $20,000.

TEACHING SUGGESTIONS FOR "WEATHER PREDICTING"

Purpose: To acquaint students with the job of meteorologist. To give students some basic principles for making their own predictions.

Procedures: Make dittos or transparancies of the sheets provided. These may be used as a research project (library reference or discovery of basic principles using daily weather maps or U. S. government weather maps--available from the superintendent of documents).
These may be used as class discussion notes or as a worksheet in review for a test.
Read the job description of the meteorologist.

Answers: Page 1

1. Strong flow of moist southerly air.
2. Winds off the lake; surface temp. less than 0°C.
3. Cirrus; about 8-16 hours; longer in arriving means longer in staying.
4. Cumulonimbus.
5. Violently shifting, raining in localized areas.
6. Frontal rain is along a long band of area.
7. A storm is approaching fast.
8. Fair weather is coming.
9. Day by day predictions are fairly accurate (except thunderstorms) long term climate is well understood (except cyclical variations like the ice ages). Specific preditions for longer than three days are very inaccurate.

General principles the students should discover about weather predictions:

1. Fronts move mostly from west to east at about 600 miles per day.
2. Cold fronts move out of the north so their general direction is from the N.W.
3. Warm fronts move from the S.W.
4. High and lows in general move toward the east except when steered by the jet stream (it will move them in a northeasterly direction if it is going toward that direction--ie. from the southwest).
5. Winds move clockwise around highs, and counterclockwise around lows.
6. Lows occur at bends in the fronts, highs exist between fronts.
7. A front can be found on the map where there is a large change in wind direction and temperature.
8. Occluded fronts form when a cold air mass overtakes a warm air mass.
9. Hurricanes hit land when steered toward it by high pressure nearby.

Answers to weather precidting: pages 2 - 11.

1. 600 miles to S.E.
2. 600 miles to N.E. (warm front has rounded edges)
3. 600 miles to E.
4. 600 miles to E.
5. Low pressure where fronts meet; high pressure somewhere near S. E. United States; High in upper plains states.
   Bottom: High in central U. S.; low off E. coast of Virginia.
6. Toward the S. E.
7. Front will move to about Chicago then become stationary.

8 and 9. Clockwise around high; counterclockwise around low.

10. Cold front from Arizona to Wisconsin (where winds change direction in a short distance is called a front--it is a cold front because near the front, the winds from the north are moving with the front; the southern winds are being pushed out of the way. Warm front-from Wisconsin through Ohio to Maryland.
11. Cold front-from Western Texas east to Georgia. Western winds are spiralling clockwise around a high pressure system in Nebraska.
12. Top: a cold front is swinging to meet a warm front out over the Atlantic (note the V-shape).
    Bottom: Occlusion will form earlier (V-shape is steeper) (maybe by the time fronts reach Pa. or Md.)
13. Top will--high will steer it north.
    Bottom will not--hurricane is being blocked by a strong high over the U.S. forming a stationary front.
14. The lows will be moved along in the direction of the jet stream--ie. through Ohio then east.

WEATHER PREDICTING (THE JOB OF METEOROLOGIST)

1. What conditions usually precede summertime thunderstorms?

2. What conditions usually precede "lake effect" snow flurries?

3. What clouds indicate that a warm front is approaching? How do you know from the clouds when it will come? How do you know the length of the rainy weather?

4. What clouds indicate that a cold front is approaching?

5. What are the winds like in a thunderstorm? the location of rain like in a thunderstorm?

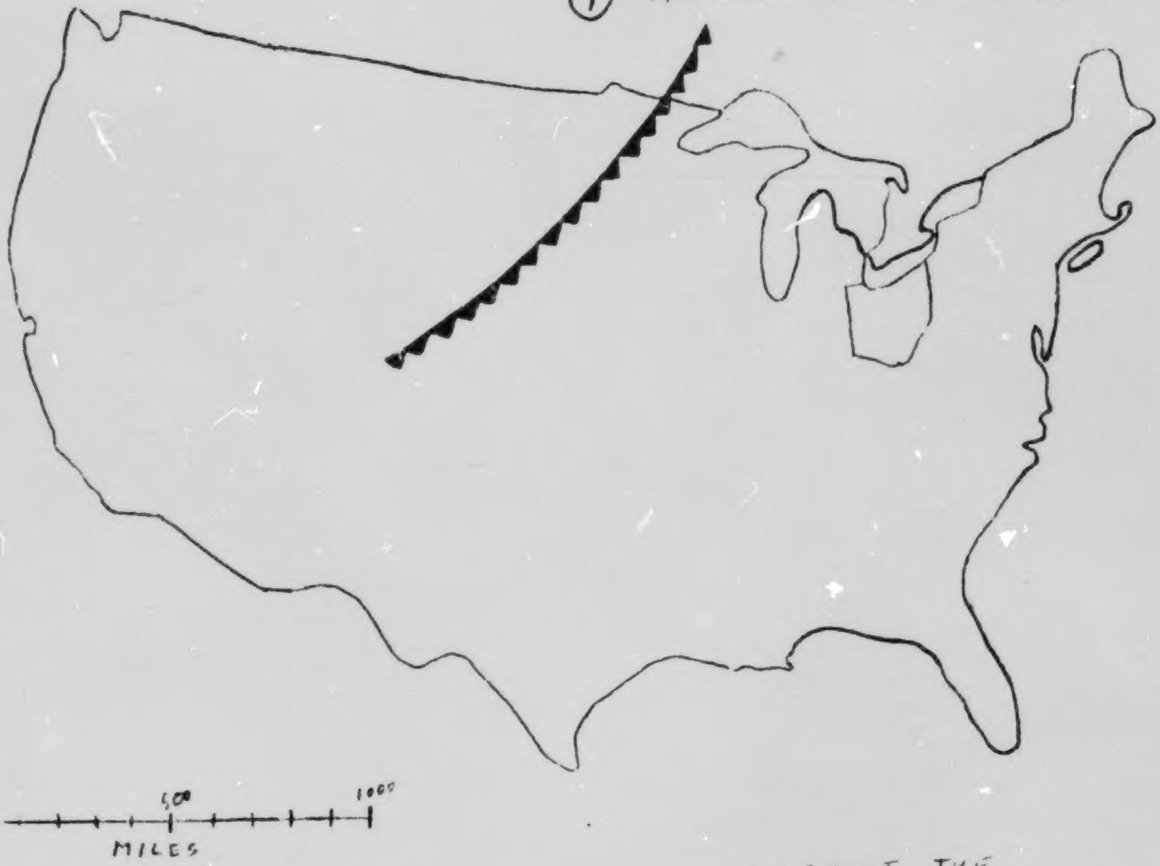
6. How does rain from a thunderstorm differ from rain along a front?

7. What does a rapidly falling barometer indicate?

8. What does a rising barometer indicate?

9. What types of weather predictions are made with the most chance for accuracy? the least chance for accuracy?

① PREDICT THE MOVEMENT OF A COLD FRONT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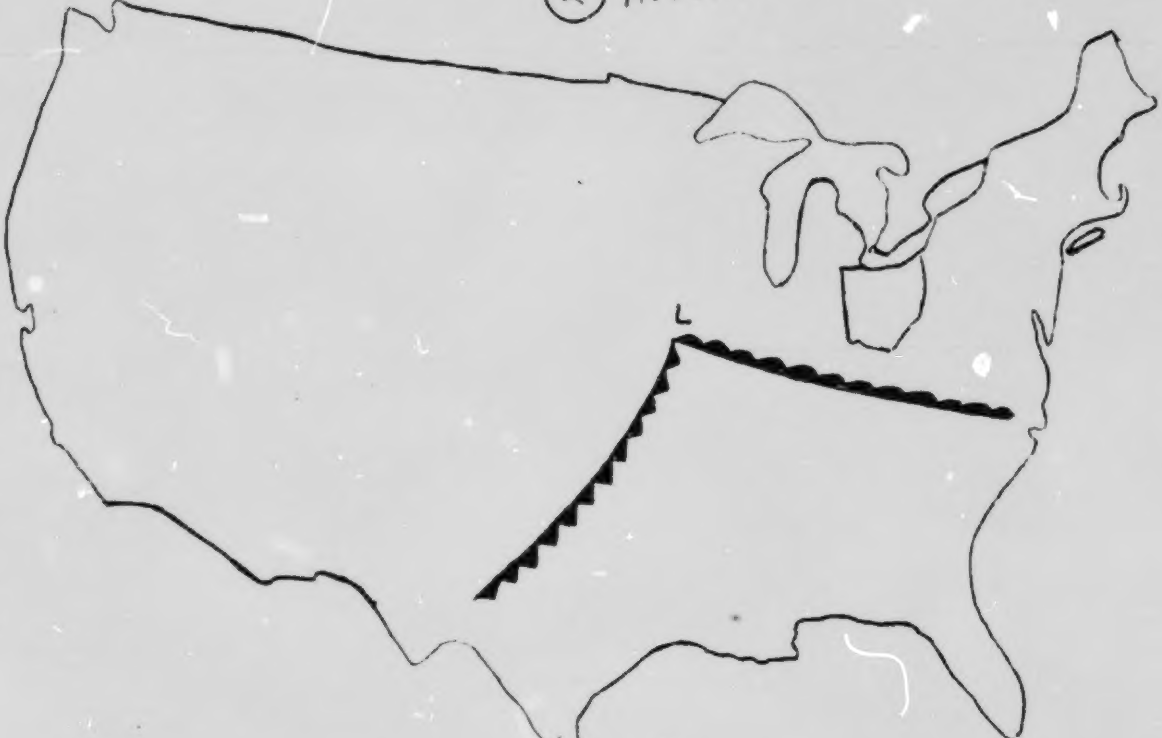
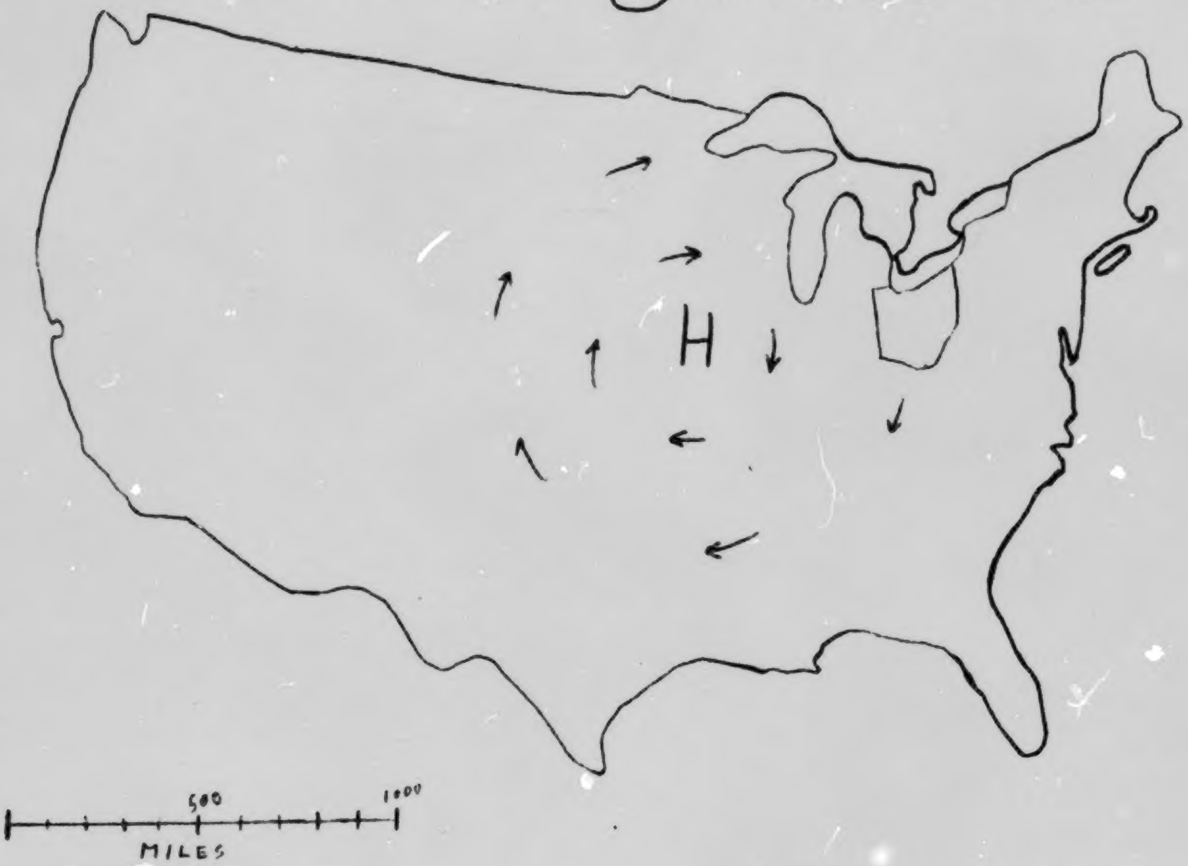
② PREDICT THE MOVEMENT OF A WARM FRONT



③ PREDICT THE MOVEMENT OF A HIGH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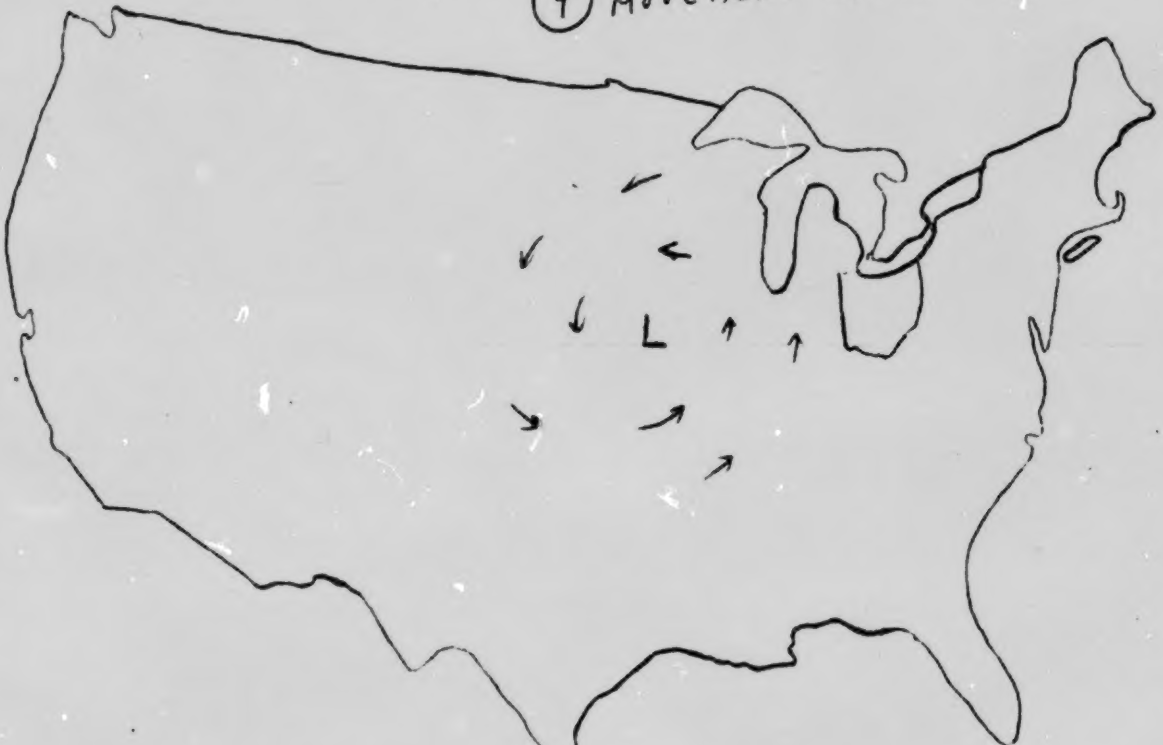
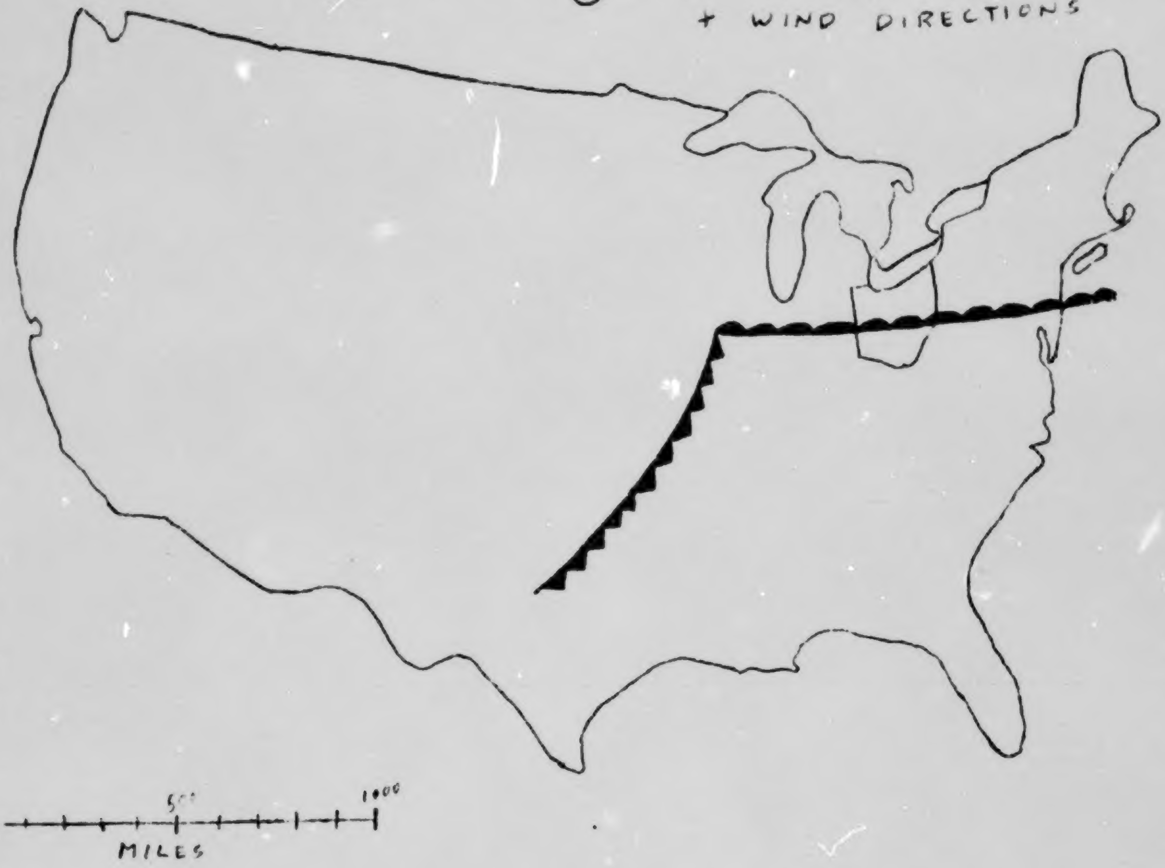
④ PREDICT MOVEMENT OF A LOW



⑤ IDENTIFY THE PRESSURE SYSTEMS
+ WIND DIRECTIONS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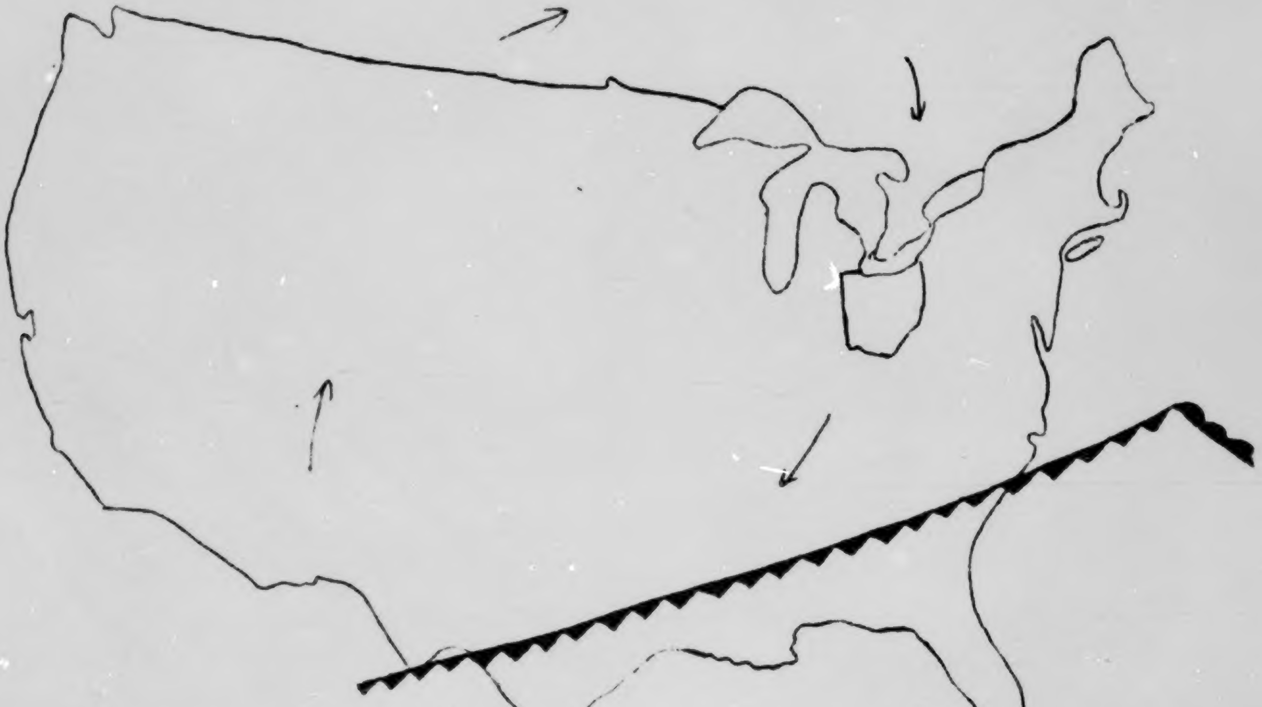
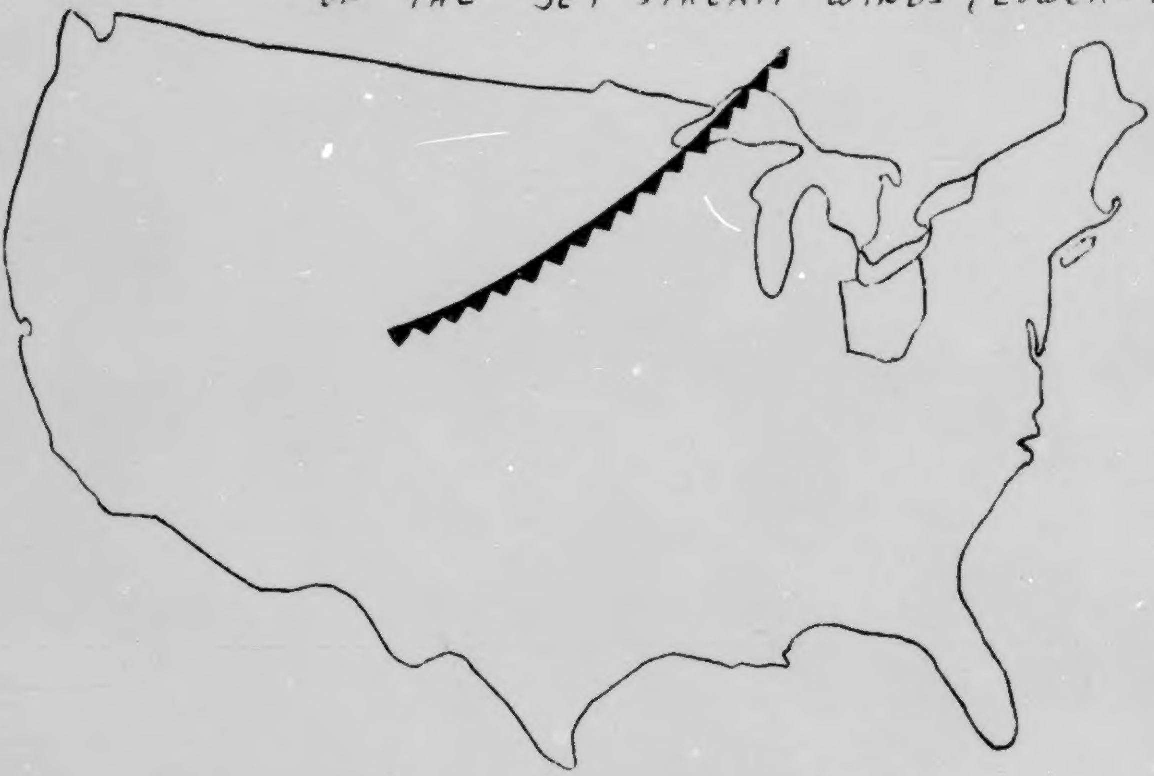
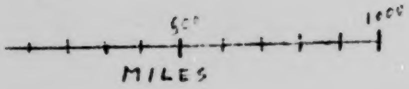


⑥ PREDICT THE MOVEMENT OF THE FRONT: BASED ON THE JET STREAM WINDS (LOWER PICTUR

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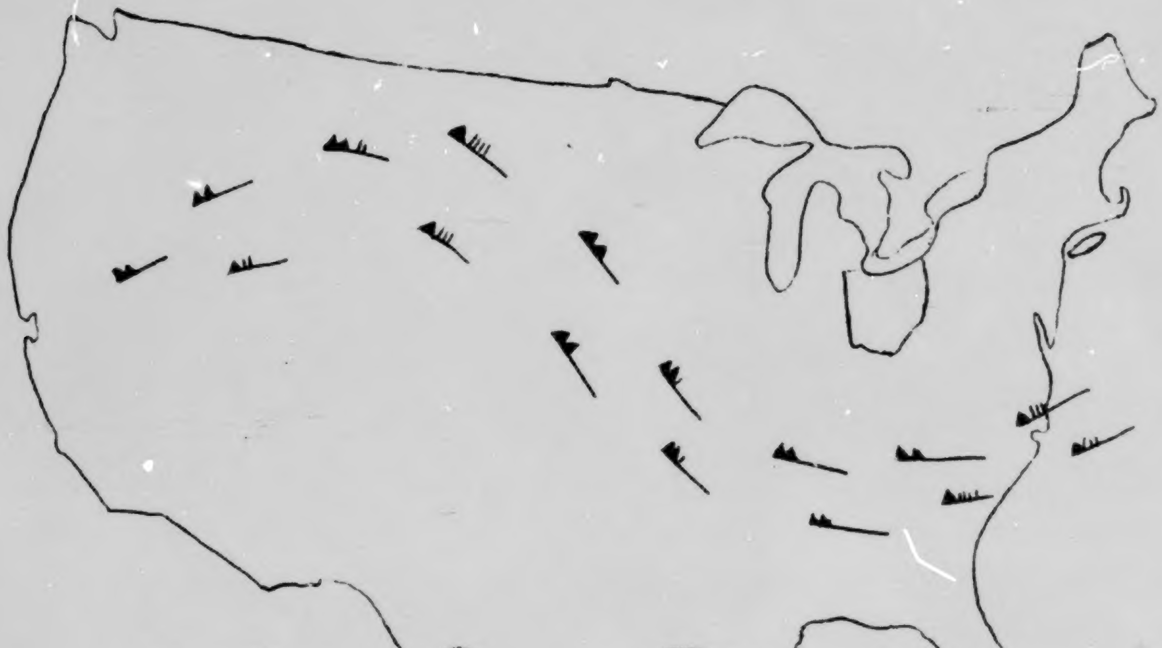

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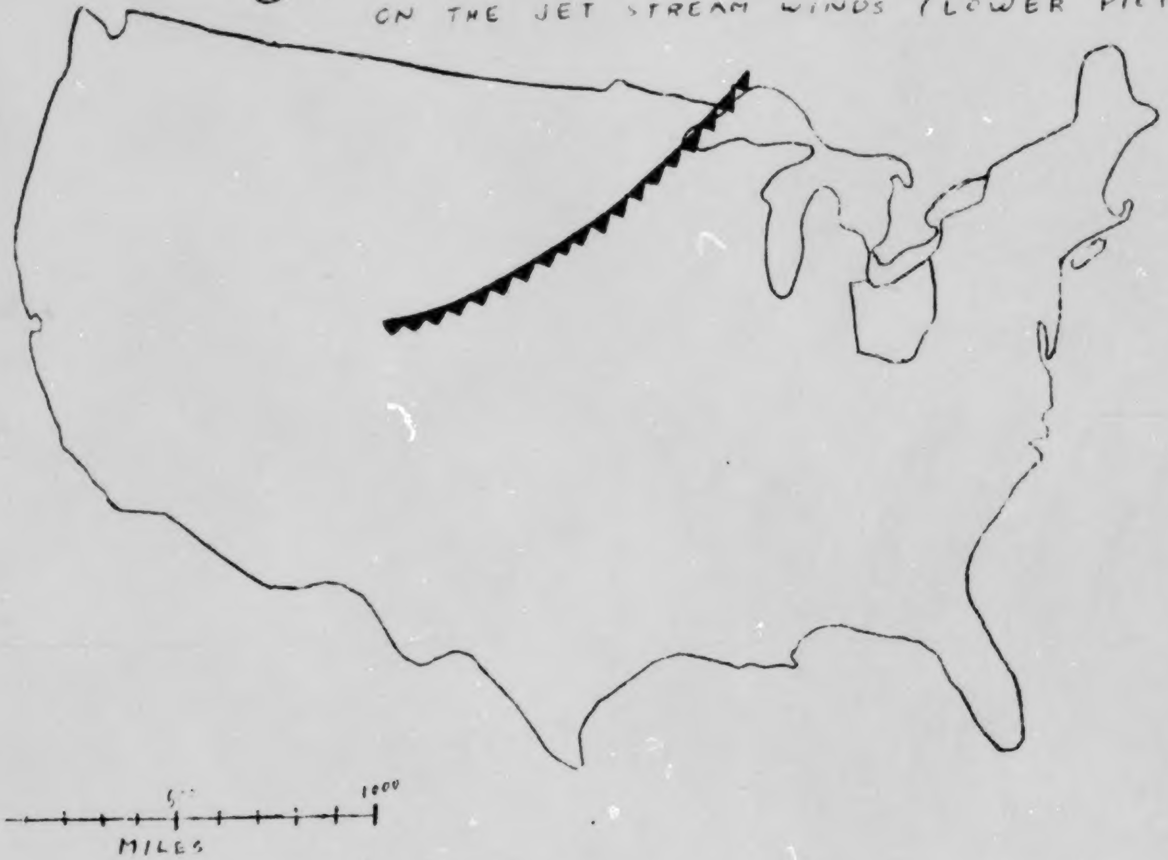
⑦ PREDICT THE MOVEMENT OF THE FRONT: BASEL ON THE JET STREAM WINDS (LOWER PICTURE)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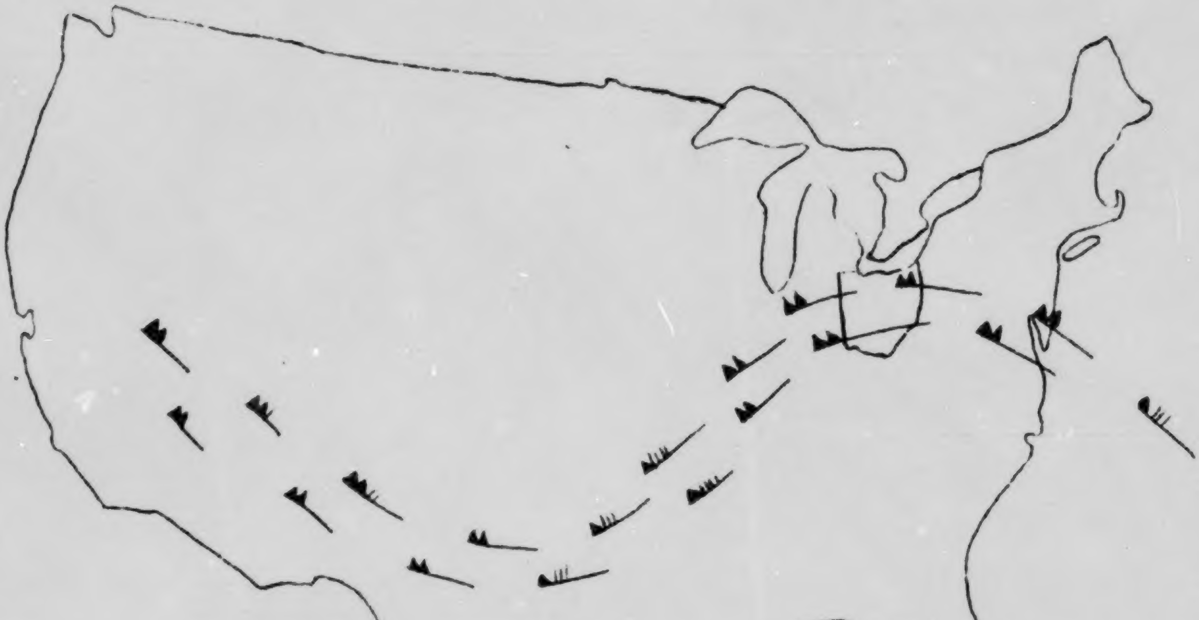

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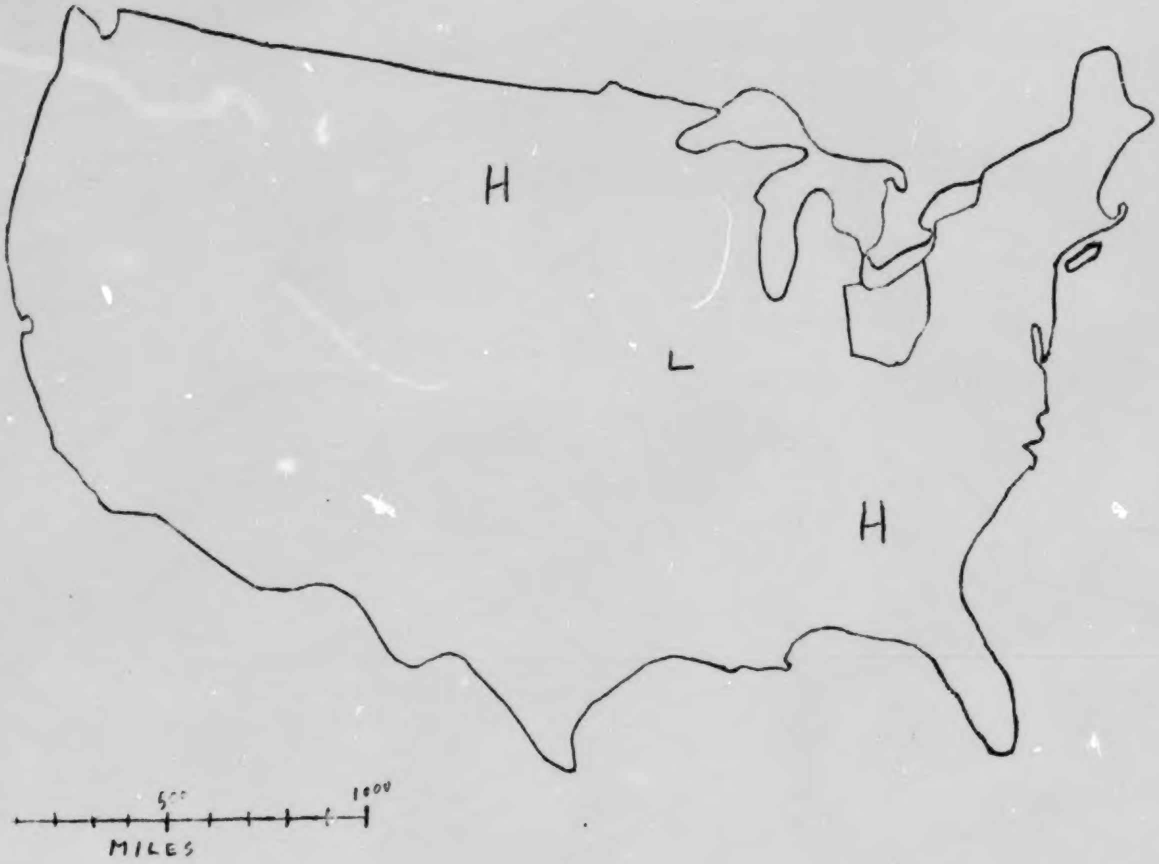
⑧ LABEL THE WIND DIRECTIONS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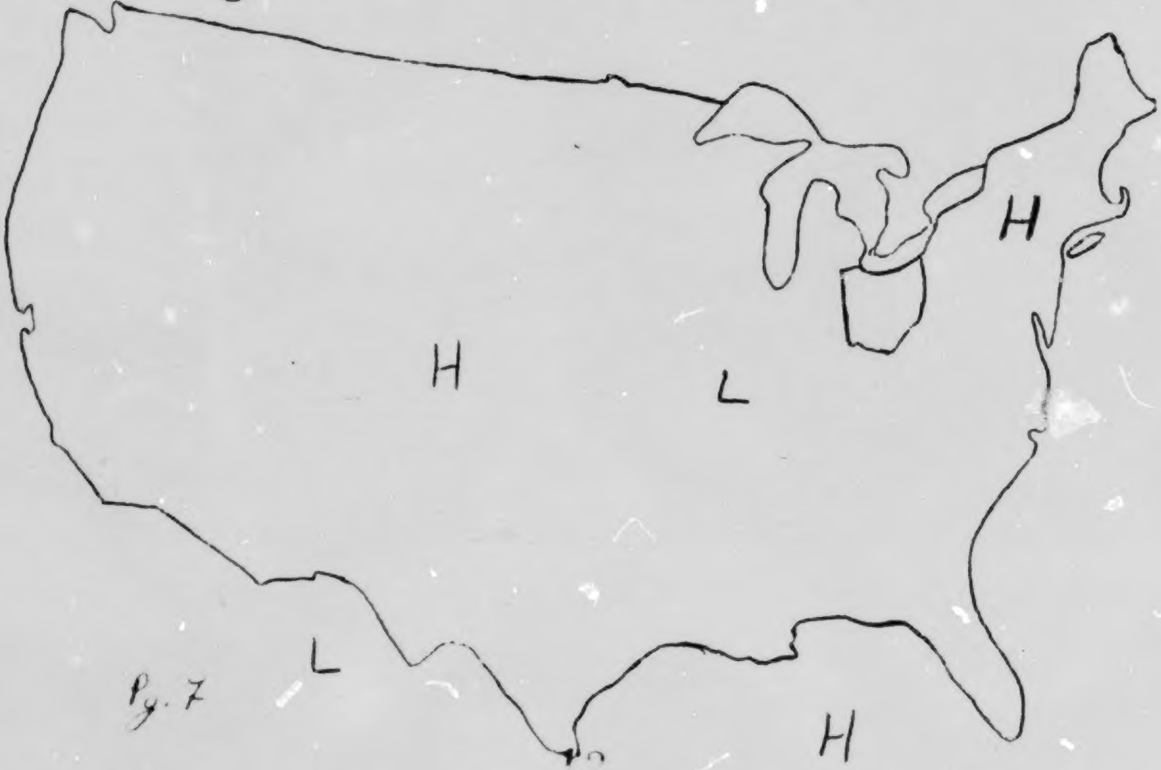
⑨ LABEL THE WIND DIRECTIONS



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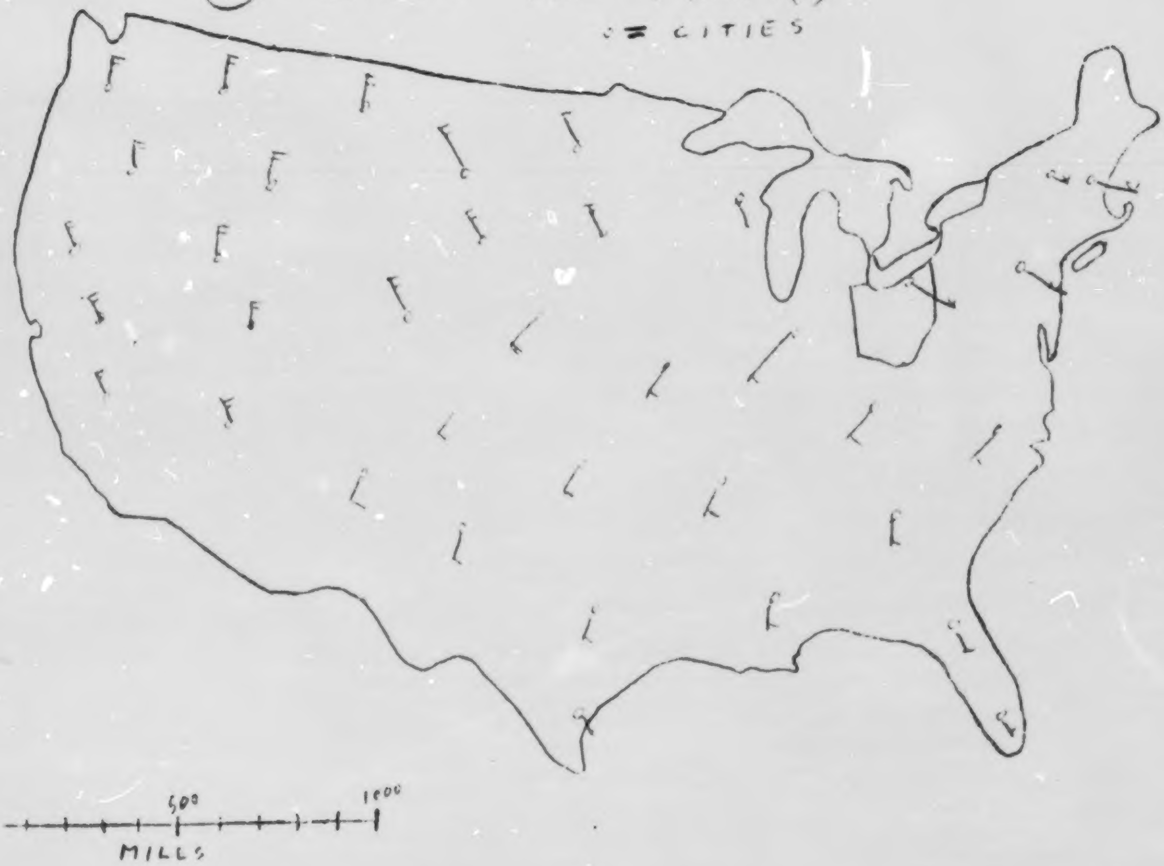
⑩ LABEL THE FRONT(S)

○ = CITIES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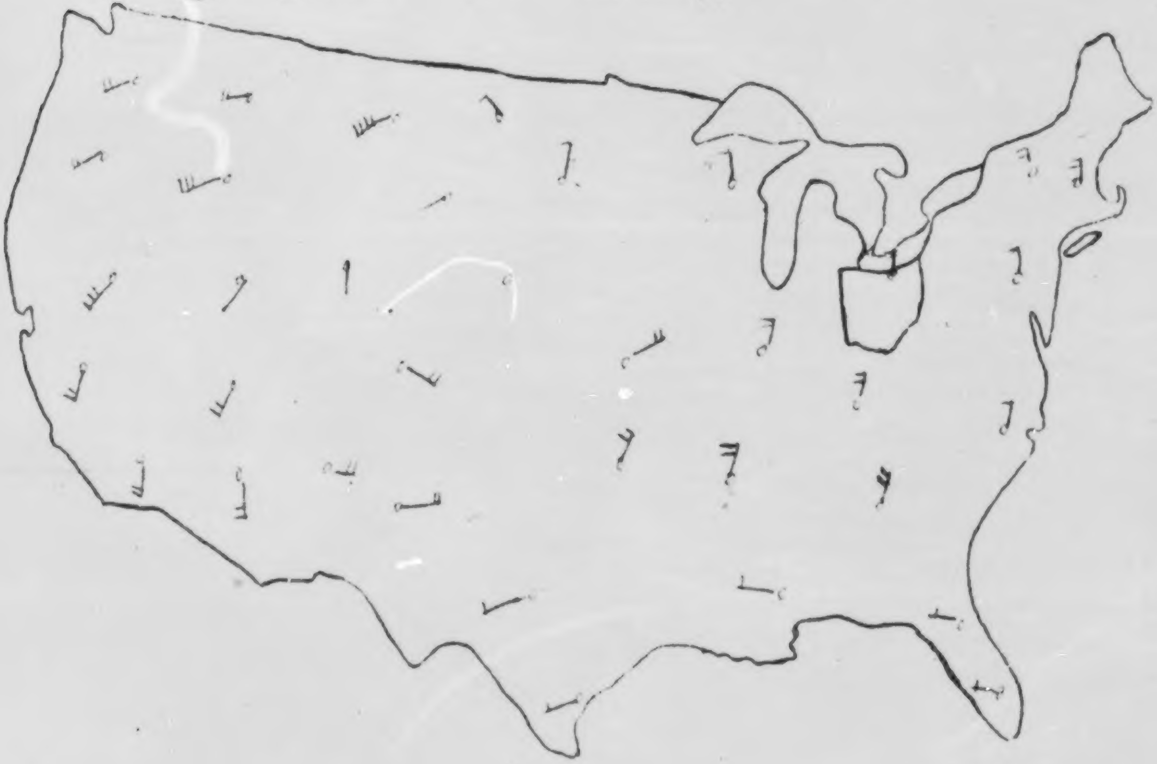
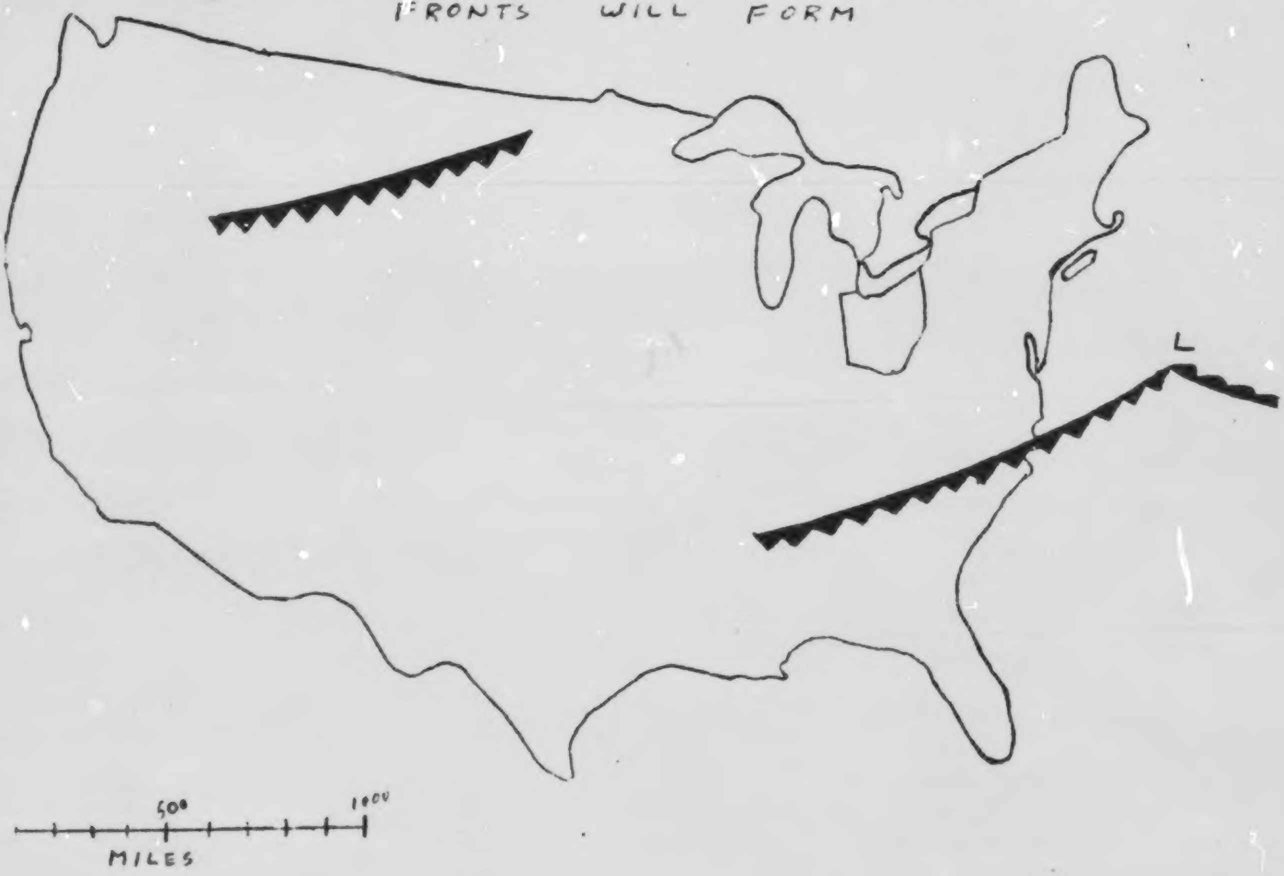
⑪ LABEL THE FRONT(S)



⑫ PREDICT WHERE THE OCCLUDED FRONTS WILL FORM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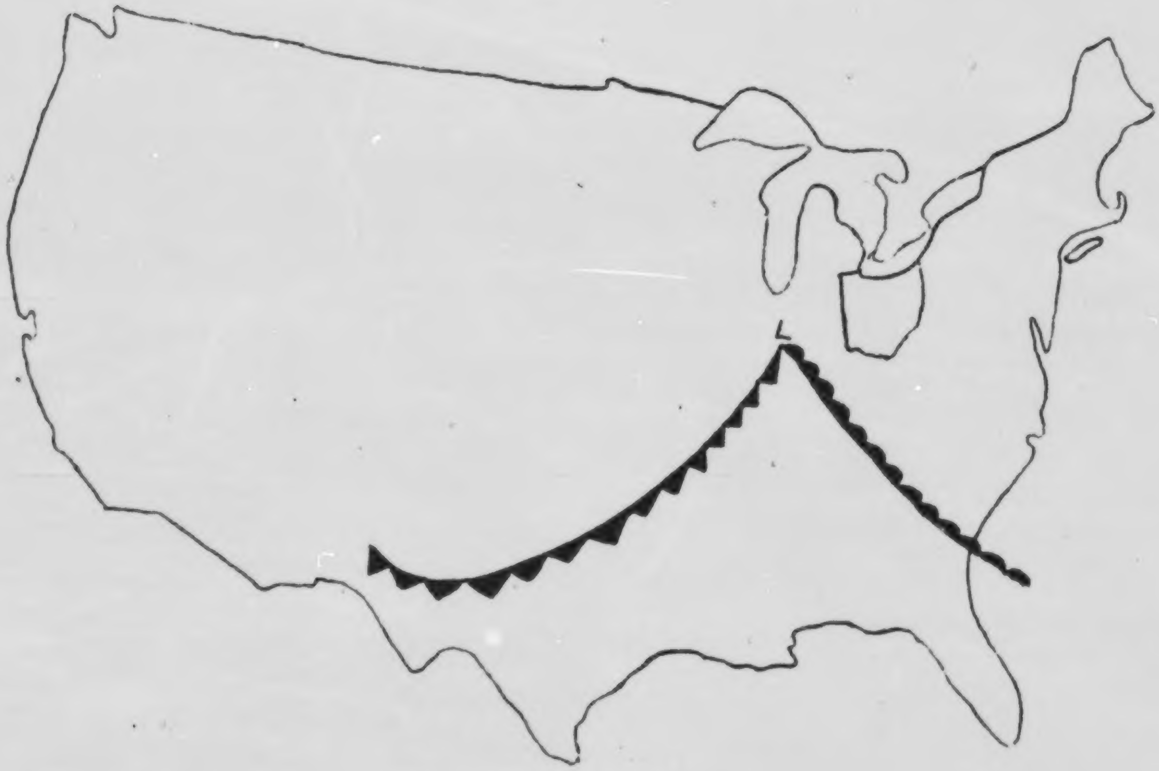
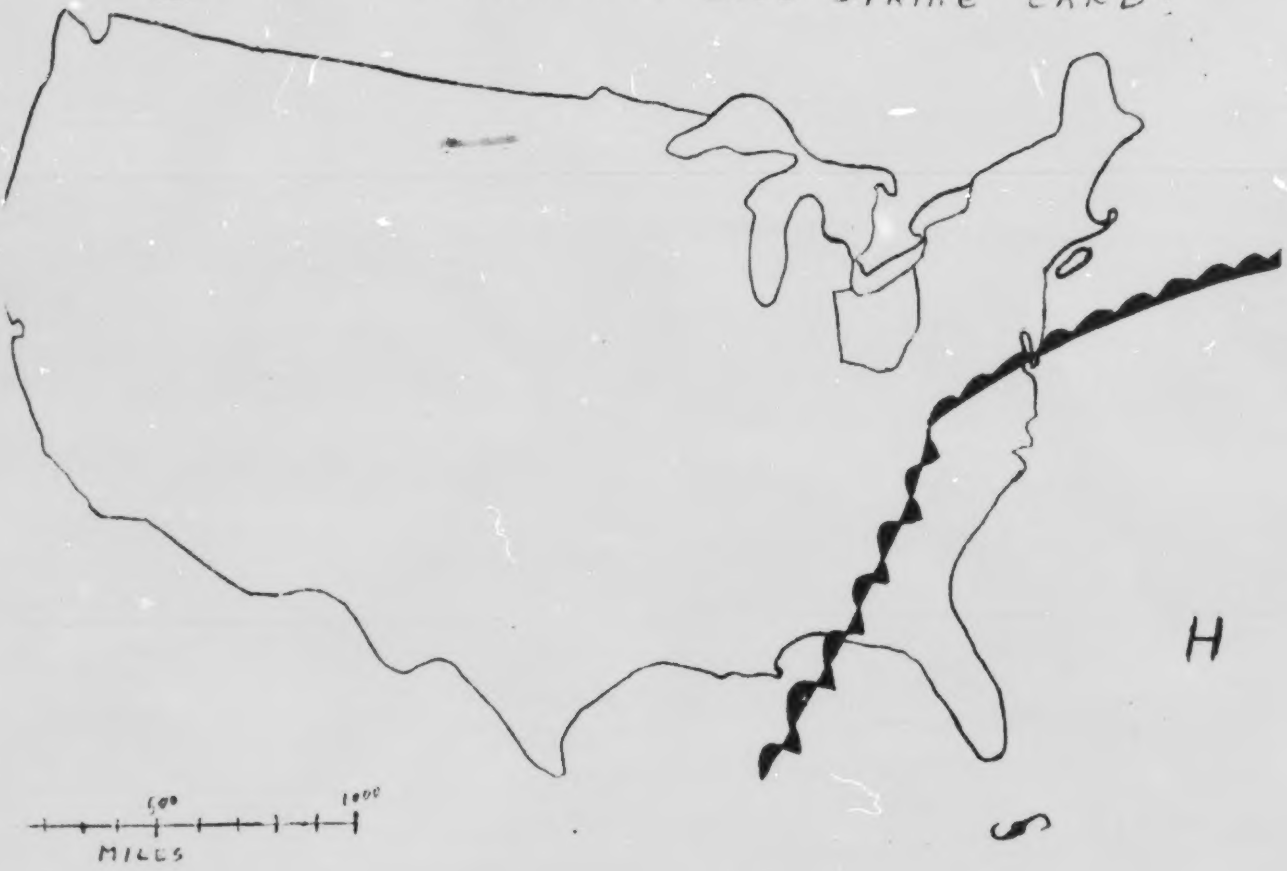


① WHICH HURRICANE WILL STRIKE LAND?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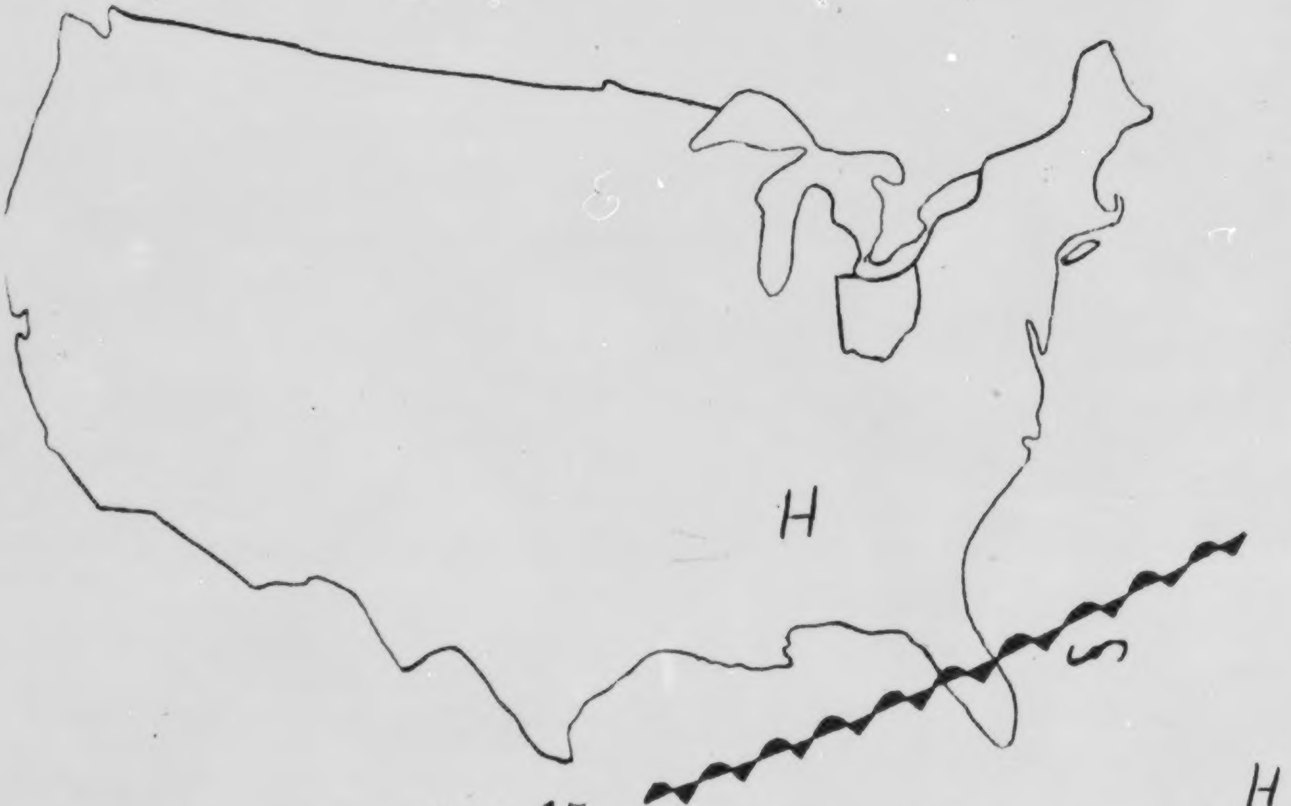

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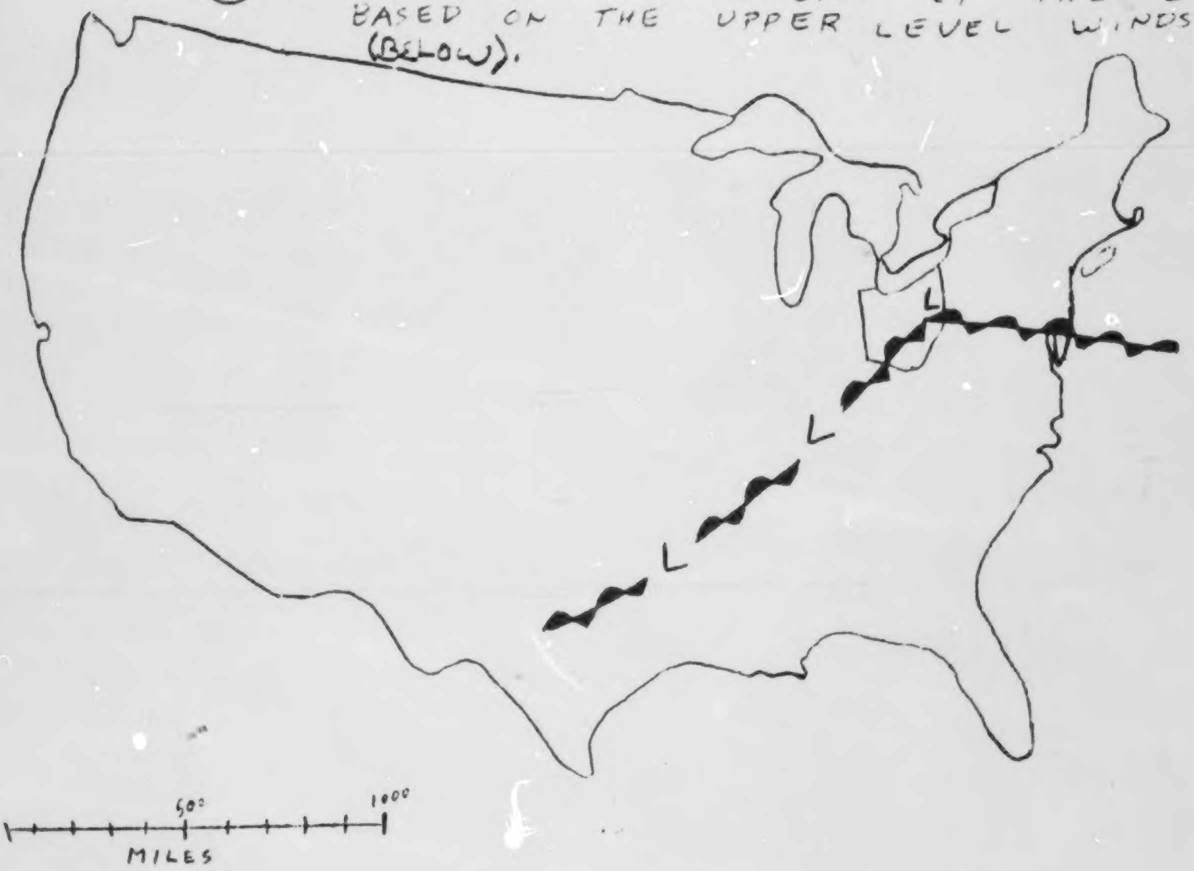
(14) PREDICT THE MOVEMENT OF THE LOWS BASED ON THE UPPER LEVEL WINDS (BELOW).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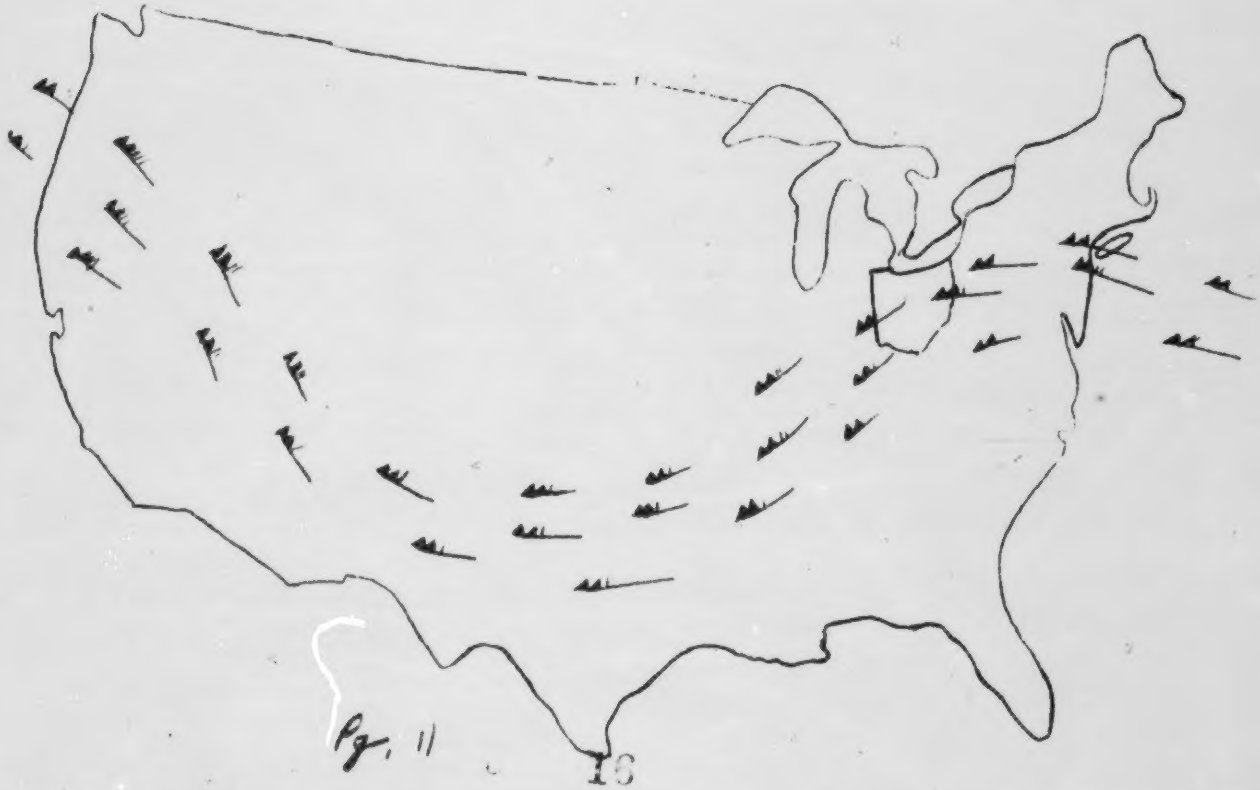


Pg. 11

THE JOB OF GEOLOGIST

Examines rocks, minerals and fossils.

Tries to determine the history of the rocks of the earth.

Tries to locate mineral and petroleum deposits and underground water sources

Uses knowledge of the rocks to aid in construction of dams, roads and tunnels.

Studies fossil plants and animals to determine their evolution.

Studies how erosion may undermine a house, bridge, etc.

Studies the layers of rock to try to find oil and minerals.

Studies aerial photographs to predict the location and extent of earthquakes.

Specific training for the job: three to six or more years of college.

Interests: working with physical objects; scientific and technical
work, abstract and creative work.

Temperaments: likes variety in the job.
likes making judgments based on numerical data.
likes making judgments based on what he sees.
likes precise standards for the work he or she does.

Salary: $8,000 - $20,000

TEACHING SUGGESTIONS FOR "GEOLOGIC SECTIONS"

Purpose: To acquaint students with the job of geologist.
To show students how it is possible to tell the history of the rocks.

Procedure: Make dittos or transparancies of the sheets provided. The object is to guess which layers of rock were formed first, which second, etc. Several principles are involved: 1. Sedimentary rocks like limestone, sandstone, and shale are formed from sediments (which are layed down horizontally). The bottom-most layer is the first to form. 2. If a cut is made through rock it must have come after the rock was formed (cuts due to erosion--as in V shaped river beds; cuts due to faulting or breaks in the rock--rock layers have slid past one another; cuts due to igneous intrusions--when lava flows up through the ground. 3. If the flat sedimentary rock is bent, it must have been bent after being formed into rock (mud does not form hills which last for millions of years).

Answers: Part 1 - this is the sequence of formation or EVENTS.

1. sandstone, shale, erosion
2. igneous rock, sandstone, faulting
3. igneous rock, sandstone, faulting, erosion
4. limestone, erosion, sandstone, erosion
5. sandstone, volcano
6. sandstone, volcano, limestone, erosion
7. limestone, sandstone, limestone, shale, sandstone buckling caused by igneous intrusion below.
8. shale, sandstone, limestone, faulting, faulting, erosion

Answers: Part 2

1. limestone, sandstone, volcano, shale
2. shale, sandstone, limestone, tilting, limestone, sandstone, shale sandstone
3. limestone, shale, sandstone, shale, buckling due to igneous intrusion, erosion
4. limestone, sandstone, tilting, sandstone, shale, limestone, faulting
5. sandstone, shale, igneous intrusion and volcano
6. sandstone, shale, volcano, limestone, erosion, faulting and tilting, sandstone, shale, sandstone, erosion

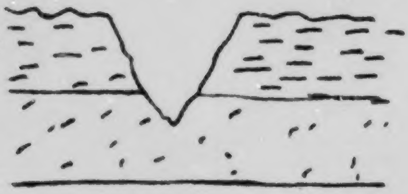
Procedures: Read the job description of a geologist
Have the students make up their own geological sections on paper or on transparancies.
With clay, actually form the layers, the intrusions, and the erosion; slice apart with a knife and try to guess the sequence of events.
Go on a field trip to Euclid creek, or better yet, through Rocky River Reservation. By starting at the low end of the park (down river) and moving up, the students can draw their own geological section.

GEOLOGIC SECTIONS (PART 1)

(THE JOB OF A GEOLOGIST)

× × × IGNEOUS   ▭ LIMESTONE   ∴ SANDSTONE   ☰ SHALE

A



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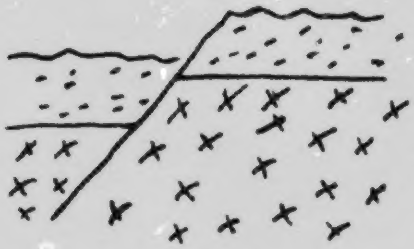

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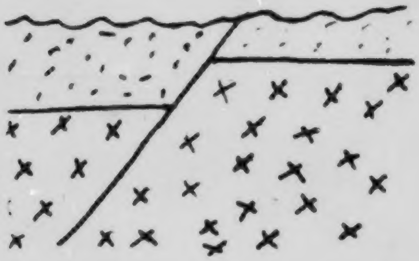

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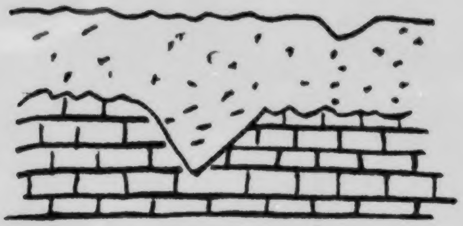

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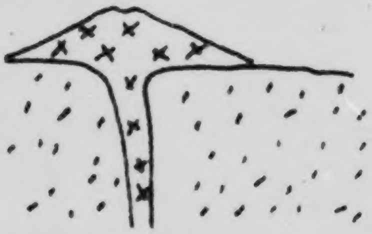

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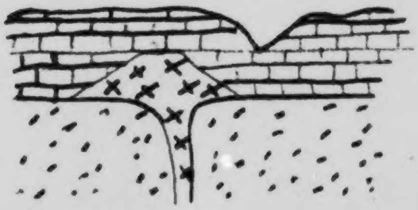

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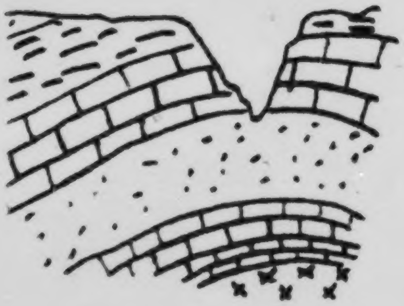

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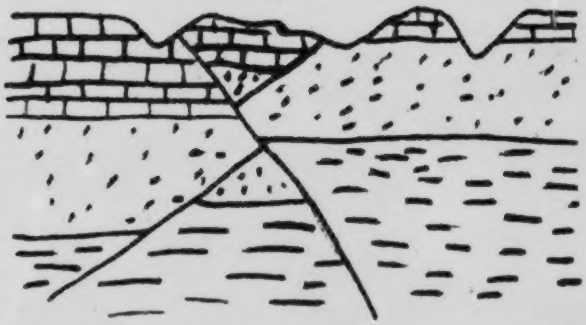

GEOLOGIC SECTIONS (PART 2)

(THE JOB OF A GEOLOGIST)

× × × → IGNEOUS

▦ LIMESTONE

∴ SANDS

≡ SHALE

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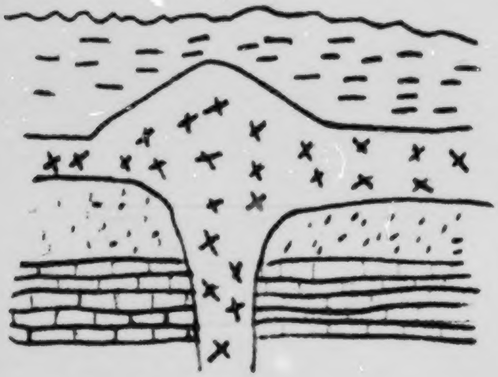

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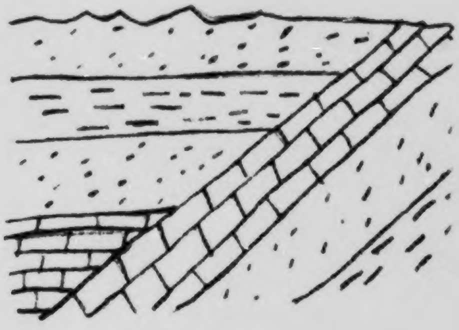

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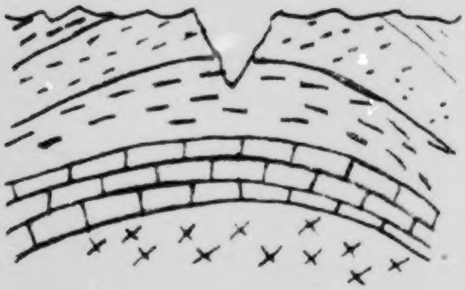

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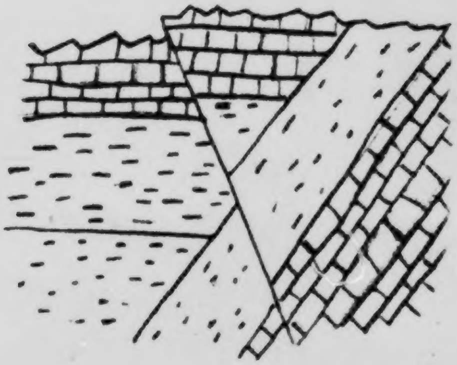

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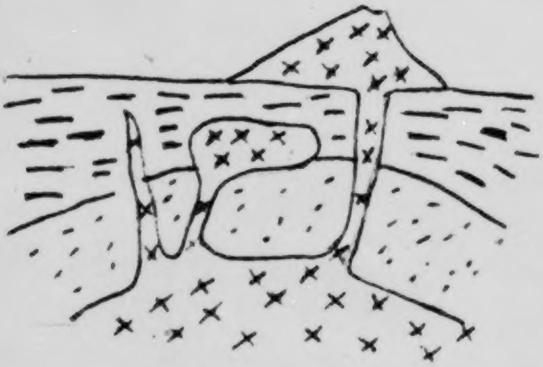

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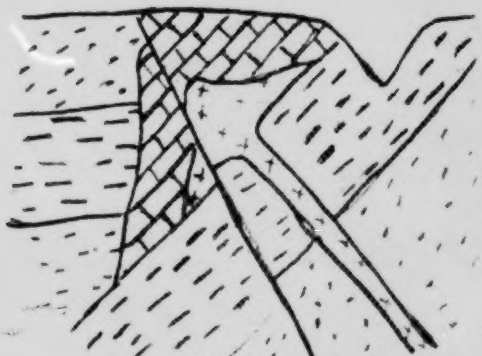


THE JOB OF MUSICAL INSTRUMENT MAKER AND REPAIRMAN

After the instrument has been assembled by machinists, he or she alters the pieces, bringing it into pitch.

Inspects instrument to determine where the defects occur.

Cuts off tubing on brass instruments or solders on tubing, to improve the intonation.

Reshapes parts using handtools.

Removes dents and fills in cracks.

Tests the keyboard, pedals, etc., on pianos to see if they operate properly.

Tunes the strings on a piano using a tuning hammer and tuning fork.

Specific training for the job (includes trade school and on the job training): one to six years.

Interests: working with physical objects; working with machines; working with something that is tangible and visibly productive.

Temperaments: likes making judgments based on numerical data.
likes precise standards for the work.

Salary: $8,000 - $20,000

TEACHING SUGGESTIONS FOR "MAKING MUSICAL INSTRUMENTS"

Purpose: To acquaint the student with the job of musical instrument maker

To teach students some of the fundamental principles of music

Answers: 1.

	one octave below		one octave above	
	128	C	512	
	147	D	588	
half the frequency	165	E	660	double the frequency
	174.5	F	698	
	196	G	784	
	220	A	880	
	247	B	988	
	256	C	1024	

2. one octave 512, 2 = 1024, 3 = 2048, 4 = 4096, 5 = 8192
3. one octave below = 220, 2 = 110, 3 = 55, 4 = 27.5
4. exactly 1.28/ 1; approximately 5 to 4
5. 256, 341, 320; approximately the notes of C, F, and E
6. when the notes, played together, sound pleasing to the ear--when the frequencies are in simple proportions as 2/1 = 512/256
7. when the notes, played together, sound unpleasant to the ear--two similar frequencies as 256 and 260
8. 660, 990, 1320 (2, 3, and 4 times the fundamental freq.)
9. All band instruments produce overtones. The amounts of each overtone make each instrument sound distinctive, even though playing the same note.
10. The frequency heard sounds different when the source of the sound is moving toward or away from you; or if you are moving toward or away from the source (train or race cars moving past you).

Discuss the job of instrument maker.

Extra research: Electronic music. How electric organs synthesize the sound of conventional instruments and even the human voice.

MAKING MUSICAL INSTRUMENTS

THE JOB OF AN INSTRUMENT MAKER

1. What are the musical notes one octave below the notes given? One octave above the notes given?

    C = 256
    D = 294
    E = 330
    F = 349
    G = 392
    A = 440
    B = 494
    C = 512

2. What musical note is five octaves above middle C (256 vibrations/sec)?

3. What musical note is four octaves below middle A (440)?

4. What is the ratio of the frequency of E to the frequency of middle C?

5. What is one half of 512?
    two thirds of 512?
    five eighths of 512?

6. What is harmony? How is it related to frequency?

7. What is dissonance? How is it related to frequency?

8. Name the first three overtones to middle E (330)

9. When are overtones played?

10. What is the doppler shift?

MAKING MUSICAL INSTRUMENTS

THE JOB OF AN INSTRUMENT MAKER

1. Using eight test tubes in a test tube rack, fill them with water in varying amounts to form an eight note musical scale (Do, Re, Me, etc.). Use a pitch pipe or some musical instrument to find out which notes you have if possible.

2. Measure the height of the air space above the water for each of the test tubes.

3. Make a graph of the height of the air space vs. the pitch of the note. Use these numbers for the pitches if you have no other references.

   Do = C = 256 vibrations/sec.
   Re = D = 294
   Me = E = 330
   Fa = F = 349
   So = G = 392
   La = A = 440
   Ti = B = 494
   Do = C = 512

4. Stretch a piece of rubber band over two nails pounded into a piece of wood.

5. Playing the rubber band like a guitar, try to find out how much the band has to be held at a shorter distance to play each of the notes of the musical scale. Make sure the tension on the rubber band does not change. (It might help if one partner put his ear close to the band while the other partner plucked the band and marked the position of the notes.)

6. Make a graph of the length of the plucked rubber band vs. the pitch of the note. (Use list above if necessary).

7. Have a student bring in a guitar and repeat steps 5 and 6 on one string only.

THE JOB OF OPTHALMOLOGIST

Diagnoses diseases and injuries to the eye.

Examines patient to try and find symptoms of disease or inborn disorders.

Prescribes medicines for the eyes if needed.

Performs surgery on the eye.

Writes prescriptions for corrective glasses and contact lenses.

Instructs patient in eye exercises.

Specific job training: four to eight years.

Interests: pride in a job well done; working for the benefit of others; scientific and technical work.

Temperaments: likes dealing with people.
likes making judgments based on what he sees.
likes making judgments based on numerical data.

Salary: $10,000 - $30,000

TEACHING SUGGESTIONS FOR WORKING WITH LENSES

Purpose: To acquaint the student with the job of opthalmologist. To give the student a feeling for the uses of some different kinds of lenses.

Materials: dark crayons or magic markers, white plain paper, shirt cardboard (or some of similar thickness), an assortment of lenses (Edmund Scientific Company has a good selection).

Notes on the procedure: to measure the focal length, turn on one very bright light in one corner of the room or use the sun if possible (if the light source is far enough away, the focal length is the distance between the lens and the image of the light.

Be careful in handling eyeglasses.

Read the job description of the opthalmologist.

WORKING WITH LENSES

THE JOB OF AN OPTHALMOLOGIST

1. Make an eye chart according to the following dimensions: (letters must be very dark and neat)

   Top letter = 46 mm high = vision of 20/100 when read from a distance of 20 feet. (20/100 means that a person who can just read this letter can see from 20 feet what a normal person can see from a hundred feet.)

   Second line has two letters = 32 mm high = 20/70 vision
   Third line = three letters = 22 mm high = 20/50 vision
   Fourth line, four letters, 18 mm, 20/40
   Fifth line, five letters, 14 mm, 20/30
   Sixth line, six letters, 12 mm, 20/25
   Seventh line, seven letters, 10 mm, 20/20
   Eighth line, eight letters, 7 mm, 20/15
   Ninth line, nine letters, 5 mm, 20/10

2. Mount an assortment of lenses in cardboard so that you can see through the lenses but can't see around them. (Mount each in a small piece of cardboard).

3. Number the lenses and on a separate sheet of paper record the focal lengths of the lenses. (The distance between the lens and the image of a light source very far away.)

4. Also describe each lens in terms of convex, concave, plano-concave, etc.

5. Test each lens with the eye chart you have made. Record the results along with the lens data above. Make sure you stand 20 feet back from the chart. Also be sure to use several people when you test the lens. Record any known eye defects along side the person's name.

6. Now carefully look at the eyeglasses of three different people. Record their focal lengths and shapes. Test your eyes with these also.

7. What conclusions can you draw as to the type of lenses used in eye prescriptions.

8. Which of the following would not make good eyeglasses: double concave, double convex, plano-concave, plano,convex, concavo-convex, convexo-concave?

9. On the reverse side describe the defects of nearsightedness, farsightedness, and astigmatism. Show what the person sees. Show how the light is focused by the eye. What kind of lens would be used to correct each defect?

	WORKING WITH LENSES (THE JOB OF AN OPTHALMOLOGIST)			SUBJECT #1	SUBJECT #2	SUBJECT #3	SUBJECT #4
LENS NUMBER OR OWNER	DRAWING	TYPE OF LENS	FOCAL LENGTH	EYE DEFECTS	EYE DEFECTS	EYE DEFECTS	EYE DEFECTS

THE JOB OF ASTRONOMER

Observes the stars, the sun, moon and planets.

Uses the optical and radio telescopes equiped with cameras, spectroscopes, and other specialized equipment.

Determines the size, shape, brightness and motions of the planets and other heavenly bodies.

Develops mathematical tables of the motions of these objects for use by air and sea navigators.

Tries to determine the origin of the planets and the stars.

May design new equipment for use in studying the stars and planets.

Specific training for the job: four to six years of college.

Interests: scientific and technical work; abstract and creative work.

Temperaments: likes planning the whole job.
likes making judgments based on numerical data.
likes making judgments based on what he sees.

Salary: $10,000 - $20,000

TEACHING SUGGESTION OF COMMUNICATING WITH ANOTHER INTELLIGENCE

Purpose: To acquaint the student with part of the job of the astronomer
To suggest the difficulty of talking to other peoples from space.

Materials: world map; pins;

Notes on the procedure:

1. This of course is a very inexact method for figuring the probability of spotting a human being if you landed at random on this planet but it is an approximation. Spotting man's activities such as roads and pollution is not the same as spotting a man. This would be analagous to what the Viking spacecraft will encounter when it lands on Mars. It will not be able to roam around and the only "Martian Life" it will spot will be within its range of visibility.

2. and 3. It would make an interesting discussion to pass out to the class some writing in a language none of the students understand and have the class decide how to go about deciphering it. Communicating by pictures is far simpler although for long distance space communications, the pictures would have to be scanned line by line like on a television.

4. Read the job description of the astronomer. Discussion:

   In spite of all of the negative feeling about the space program, there still remains a high amount of interest in UFO's. How much effort and money should we put forth in trying to communicate with them or with other possible intelligence out there?

COMMUNICATING WITH ANOTHER INTELLIGENCE

THE JOB OF AN ASTRONOMER

1. Estimating your chances of finding man on earth.

   A. Get a world map and a small pin.

   B. Place the map in front of you and hold the pin in your hand.

   C. Close your eyes and stick the pin in the map.

   D. On a separate sheet of paper, list four animals that you could see if you were within one mile of where the pin was in the map. Record the first four animals that come to mind. Record man only if within 50 miles of a city (most probably you would then spot four other animals long before you spotted man).

   E. Repeat the pin sticking 25 times total, each time trying to hit a different section of the map.

   F. Since you now have a list of 100 animals, each animal may represent one percentage point. Group the animals together and answer the following questions: What is the chance of spotting a man? What is the chance of not spotting man. What might the chance of finding a man on earth during a brief encounter tell us about the chance of finding intelligent life on Mars during our brief landing?

2. Make up a picture code for objects in your house. You must not use actual letters or pictures that represent letters. Write out your code and let no one else see it. Now make up a few sentences that describe your house and translate these into code.

   e.g. My house has 10 rooms.

   Exchange codes and see if anyone can crack your code or if you can crack anyone else's.

3. How would you describe yourself to a spacebeing who has never been on earth. Remember it makes little sense to name the parts of your body, nor does it make sense to say you look like a monkey, etc. The outer spacebeing has had no experience with any of these terms.

THE JOB OF PAINT CHEMIST

Experiments on paints and paint pigments.

Tries to develop new and improved pigments to yield a wider range of colors.

Analyzes the oils, drying agents and other substances that make up a paint.

Tries to blend various pigments to meet the customer's needs.

Tries to improve the paint to enable it to wear longer and stick better.

Specific training for the job: three to six or more years of college.

Interests: working with physical objects; scientific and technical work, abstract and creative work.

Temperaments: likes variety in the job.
likes making judgments based on numerical data.
likes making judgments based on what he sees.
likes precise standards for the work he or she does.

Salary: $8,000 - $20,000

THE JOB OF COLOR MIXER

Mixes pigments and solvents to make paints and dyes.

May mix according to a formula, or according to a color sample.

Uses a scale, graduates, and a pH meter to measure exact amounts of the ingredients.

Compares the finished product with the sample color either visually or with a spectrophotometer (color meter)

Specific training for the job (includes trade school and on the job training): one to six years.

Interests: working with physical objects; working with machines; working with something that is visibly and tangibly productive.

Temperaments:* likes making judgments based on numerical data.
likes precise standards for the work.

Salary: $7,000 - $14,000

TEACHING SUGGESTIONS FOR COLOR MIXING

Purpose: To acquaint students with the jobs of color mixer and paint chemist.
To teach students the primary colors both additively and subtractively.

Materials: color TV, microscopes, paints (optional), newspaper sunday comic section, crayons, multi-colored construction paper, tape, scissors, 10 X hand lens, a motor (or several) and power supply.

Notes on procedures: Set up just enough equipment at five different sections of the room and allow the students to rotate through each of the five parts of the experiment.

1. Tell what proportions of the artist's primary colors would be needed to produce each of the 12 colors listed across the top. Most of the students should know this already from their art classes so it might just be adequate to fill this in as a class (thus saving a little clean up).

2. Cut out pieces of construction paper in the shape of wedges, tape them to a stiff piece of cardboard which has been securely fastened to the motor, turn on the motor and observe results. The students should write down for example that they used half red and half green to end up with yellow.

3. Cut out small pieces of the sunday comics; in each of the 12 colors named across the top. Try to get colors that are blank on the reverse side. The students should describe the patterns and colors of the printing dots (at 40 X under a microscope).

4. The students try their own dot printing (some might have already done this in art) by using just dots of color from red, yellow, blue, and black crayons, pens, or magic markers. They should try to duplicate the 12 colors written across the top.

5. Carefully observe the color TV with a ten power lens and describe the colors and brightnesses that go into making a red, an orange, a yellow, etc. (eg. red and green dots are equally bright in making up a color that appears yellow to the brain from a distance in back of the set).

6. Read the job descriptions for the color mixer and the paint chemist.

COLOR MIXING (THE JOBS OF COLOR MIXER AND PAINT CHEMIST)

		RED	ORANGE	YELLOW	GREEN	BLUE-GREEN	BLUE	VIOLET	BLACK	WHITE	GREY	PINK	LIGHT BLUE
1	ARTISTS' PAINT MIXING ... TELL WHAT PROPORTIONS OF RED, YELLOW, BLUE, WHITE + BLACK												
2	COLOR WHEELS USE WEDGE-SHAPED SECTIONS OF RED, GREEN, BLUE + BLACK CONSTRUCTION PAPER												
3	NEWSPAPER COLOR DESCRIBE A MAGNIFIED VIEW (LOW POWER MICROSCOPE)												
4	DOT PRINTING USE RED, YELLOW, BLUE + BLACK PENS												
5	COLOR TV LOOK CAREFULLY WITH A 10 x LENS												

THE JOB OF MECHANICAL [illegible]GINEER

Plans and designs tools, engines, and machines.

Oversees installation, operation, and repair of this equipment.

Designs gas, water, and heating systems.

Specific training for the job (on the job training and college courses): three to ten years

Interests: pride in his work; communicating with people; scientific and technical

Temperaments: likes change.
likes planning the whole job.
likes dealing with people.
likes making judgments based on what he sees.
likes making jedgments based on numerical data.
likes precise standards for the work.

Salary: $12,000 - $20,000

TEACHING SUGGESTION TO MAKING GEARS

Purpose: To acquaint the student with the job of mechanical engineer. To give the student an understanding of the importance of gears. To give the student a basic knowledge of how gears work.

Materials: Ask the industrial arts teacher for old gears; small sets of gears can be purchased inexpensively from Edmund Scientific Company. (These materials are all optional, but an experience that the student can have in actually building the gear arrangements will help in understanding).

Procedure: If the class has been discussing gears, this may be given as a worksheet; if the actual gears are available this assignment would work well as a discovery lesson. This may be given to advanced students as a research project.

Read or have the students read the job discriptions of mechanical engineer and machinist.

Answers:

1. Student is to draw a small gear with six teeth (in order for the gears to work well, the tooth size must be the same).
2. Small gear with four teeth
3. Large gear with 24 teeth
4. Large gear with 36 teeth
5. Large gear with 24 teeth
6. Any single gear
7. Any two gears (all three connected in a line)
8. One possible solution: second gear has 12 teeth; third gear in the line will have six teeth.
9. B = 2 rev/min. counterclockwise
   C = 2 rev/min clockwise
10. No
11. Yes
12. No
13. Yes

For these four problems, trace out the direction of motion for each gear; when you get back around to the driving gear you will find out whether or not the set-up will turn (a gear can't go in two directions at once).

14. Electric can opener, record player, tape recorder, garage door opener.
15. Transmission, differential, steering

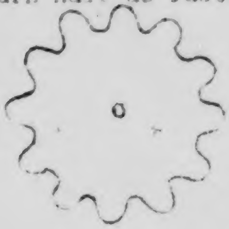
MAKING GEARS (THE JOB OF MECHANICAL ENGINEER)

Draw a gear next to the indicated gear which will:

1) Turn twice as fast..

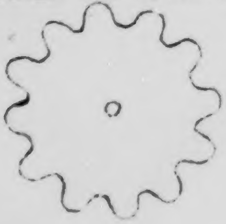
2) Turn three times as fast..

3) Turn half as fast..

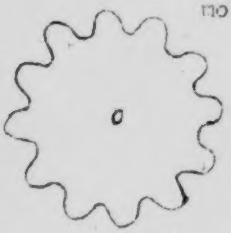


4) Turn one third as fast..

5) Double the transmitted force..

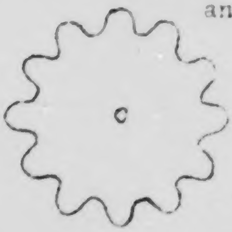


6) Reverse the direction of movement..

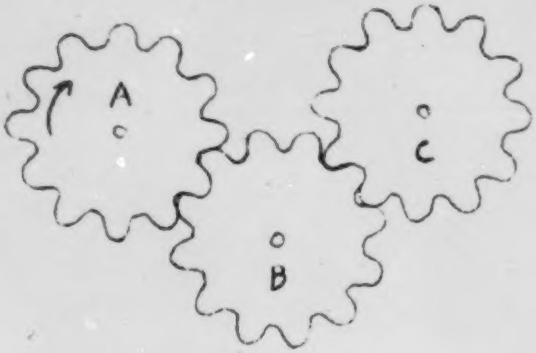


7) Keep the direction the same (need more than one gear)..

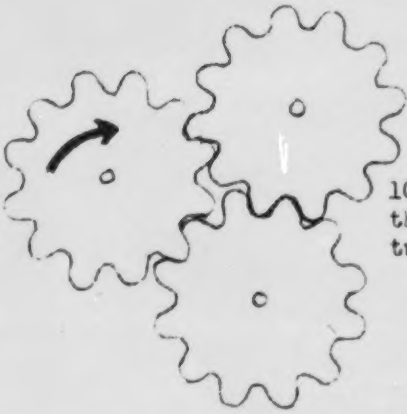
8) Keep the direction the same and go twice as fast..



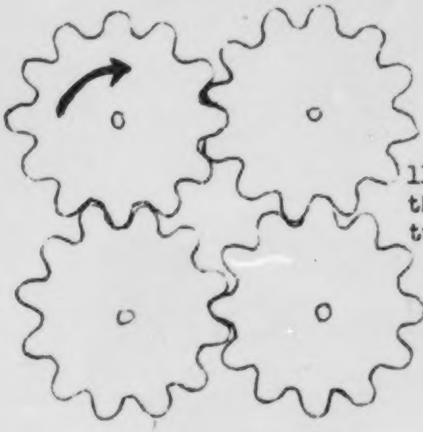
(MAKING GEARS PAGE TWO - THE JOB OF MECHANICAL ENGINEER)



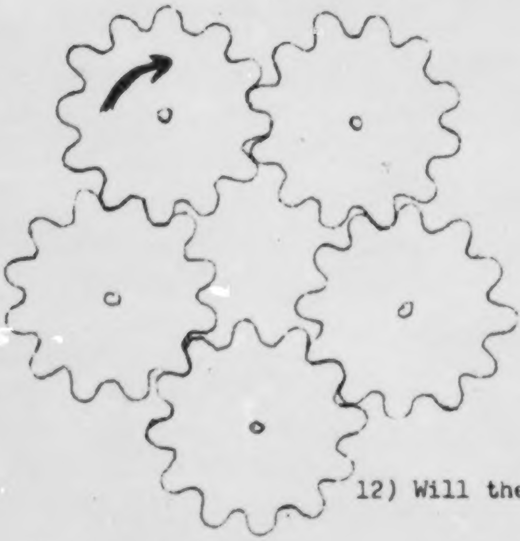
9) If gear "A" turns at 2 rev/min. How fast and in what direction will gear "B" turn? gear "C"?



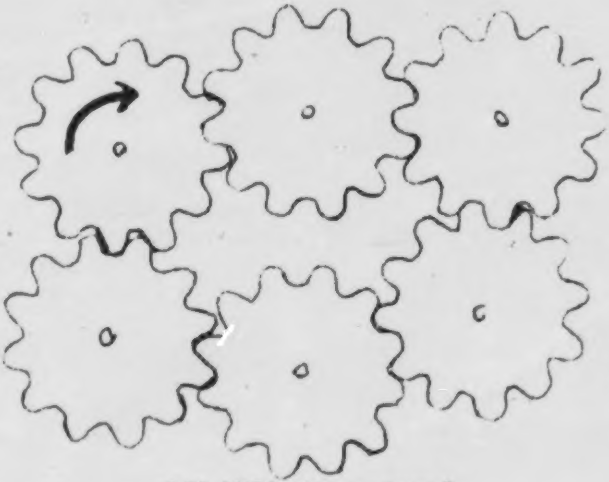
10) Will these gears turn?



11) Will these turn?



12) Will these turn?



13) Will these turn?

14) Name at least one place at home where gears are used?

15) How many places in a car are gears used? Where?

THE JOB OF PSYCHOLOGIST

Studies human behavior.

Carries out experiments on such problems as intelligence, growth, learning, personality, and the sense organs.

A clinical psychologist diagnoses mental and emotional disorders of people.

A counseling psychologist tries to help individuals and groups achieve their best efficiency.

A developmental psychologist studies how children learn; how they grow; how they develop.

An educational psychologist studies the problems of learning in the classroom.

An industrial psychologist studies the problems of working in industry; lighting, boredom, stress, etc.

Specific training for the job (on the job training and college courses): four to ten years.

Interests: communicating with people; scientific and technical work; abstract and creative work.

Temperaments: likes planning the whole job.
likes dealing with people.
likes making judgments based on what he sees.
likes making judgments based on numerical data.

Salary: $8,000 - $23,000

TEACHING SUGGESTIONS FOR TESTING HUMANS FOR STRESS

THE JOB OF A PSYCHOLOGIST

Purpose: To acquaint the student with the job of psychologist.
To teach students the needs of people in a city.

Procedures:

1. What is the minimum space that will contain the class comfortably?
    A. Pack students into a corner of the room. Have them all face toward each other. Place desks around them to keep them in this confined area for five minutes.
    B. Discussion: see questions one to four (perform procedure number two before having any discussion).
2. Draw a seating chart on a sheet of paper with the students names on it. Tell the students that they are going to take a logic test (in reality this is a test for boredom). The test will consist of the teacher reading off letters of the alphabet in random order. The student's task is to write on his paper the second letter of the alphabet following the letter spoken (if y or z are called, the student is to leave the space blank). Teachers note: On the seating chart, mark checks for any sign of nervousness, questions, exclamations, etc. that indicate boredom. Discussion: see questions 5, 6, and 7.
3. Physical stress: student is to hold five books in his outstretched arms for as long as possible. Student must not bend arms or brace the books in any way. Discussion: question 8
4. Have students stare directly into two or three very bright light bulbs for five minutes. Then have them cover their heads with paper bags for five minutes. Discussion: questions 9 - 11.
5. Play a tape or record at a distorted volume. Discuss questions 12 and 13.
6. Read or have the students read the job description for a psychologist.

TESTING HUMANS FOR STRESS

THE JOB OF A PSYCHOLOGIST

Answer the questions following the class activities
Activity 1....listen to direction.

1. How long could you survive in a space this small?
2. How many people could we fit into the world if everyone was packed this tightly?
3. What is the minimum space you need for privacy? for recreation?
4. What are the effects of overcrowding in cities?
5. Name some of the jobs that you feel would be boring to perform.
6. What does boredom do to a worker? Do you know anyone who is bored with his or her job? Why?
7. What happens to people who are out of work for a long period of time. How do they deal with boredom? Suggest a method to help senior citizens make their life more pleasant.
8. How much physical stress can you take compared with the class average?
9. How much light is pleasant? What kind of damage can occur with too much light?
10. What is the minimum amount of light we need to be comfortable?
11. What factors may involuntarilly increase or decrease our light supply?
12. How much noise is necessary for life?
13. How much noise is too much noise?
14. How do psychologists make life more pleasant?

TEACHING SUGGESTIONS FOR TESTING CONCENTRATION

Purpose: To acquaint students with the job of psychologist. To make students aware of the harm of excessive noise.

Materials: Pre-record five minute section on tape from a variety of sources: soft music, rock music, an alarm clock ringing, a noisy cafeteria; a street corner; etc.

Procedure:

1. Run off sufficient copies of five of the work sheets for the entire class. Pass out only one of them at first.

2. Begin the test with a period of silence (as a control) At the beginning of this silent period, the student is to either follow the dots or work the math problems. (The dots do not form a picture but are merely used as a simple test to measure concentration.) Run the test from two to five minutes depending on the class (longer times will make it less interesting). At the conclusion record the number of math problems correct or the highest number reached correctly on the dots. (Count the multiplication problems as five times the value as the others since they take about five times longer to do.)

3. Repeat the same procedure this time playing one of the noise sources at as close to correct volume as possible.

4. Continue with as many sources as time or interest permits.

5. Draw some conclusions about the role of noise in our lives.

6. Read the job description of a psychologist--how does he or she make a valuable contribution to our society?

7. Assign further research on noise pollution.

TESTING CONCENTRATION: FOLLOW THE DOTS (1)

6 26 13 29 2 21

9 18 42 20 12 45

32 25 1 34 24 31

38 47 37

14 17 8

41 16 50

30 43

3 35 11 28 48 4

44 19

33

40 15 22 49 5 36

46 39

23 7 27 10

TESTING CONCENTRATION: FOLLOW THE DOTS (2)

THE JOB OF A PSYCHOLOGIST

8

37

23 11 42

3 30

38 45 39

22

31

49 10 1

7

16 43

26

9 40

20

27 29

34

33

18 4

12

2 36

44 25 6

48

21

28

13 32

14

35 47

19

46 41

17

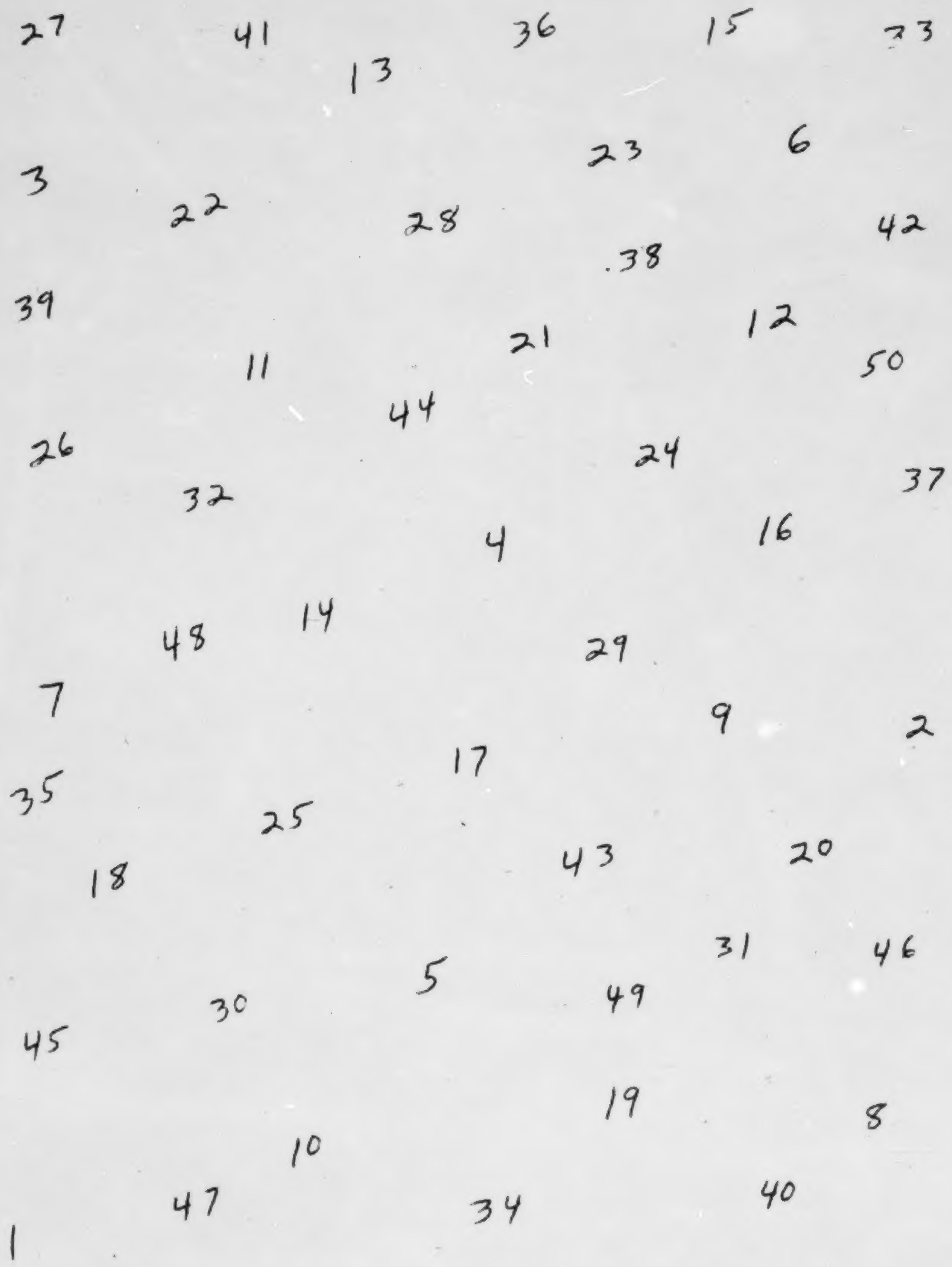
50

15 5

24

TESTING CONCENTRATION: FOLLOW THE DOTS (3)

THE JOB OF A PSYCHOLOGIST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37
32
16
4
14
48
29
7
9
2
17
35
25
43
20
18
31
46
5
49
30
45
19
8
10
40
47
34
1

TESTING CONCENTRATION: FOLLOW THE DOTS (4)

6

1 40 19

38 15

34 13 25

46 42

31 10

37

18 24 50

2

5

43 20

30 28 33 27

9

47 39

45 17 11

48 7

29

3 23

36

41 22

49

12

26 8

32

4

44

21 14

16 35

TESTING CONCENTRATION: FOLLOW THE DOTS (5)

THE JOB OF A PSYCHOLOGIST

29 8 44 21 49 42

2

37

17 33 26 16

3

43 50

11 35

10

7 22 31

18 47 15 20

1

12

45 28 39

23 4

36

32

25

14 19

5

40 48

30

11

6 38

24 46

3 27 34 9

TESTING CONCENTRATION : MATH (1)

THE JOB OF A
PSYCHOLOGIST

1) 37925
+46177

2) 46690
-28997

3) 55725
x12482

4) 38910
-36921

5) 78910
x57829

6) 58200
+18590

7) 98291
-48600

8) 37181
-35889

9) 91226
+48299

10) 36575
x28694

11) 58372
-37691

12) 96106
x23564

13) 42891
x49382

14) 30199
-18397

15) 80677
-24857

16) 39281
+94652

17) 43371
x69473

18) 59482
-19485

19) 79864
-28475

20) 59788
x35937

21) 39588
+63799

22) 95483
+39050

23) 58600
+28505

24) 48571
-11038

25) 95812
x48690

26) 47521
x53600

27) 58693
x38699

28) 49862
-48597

29) 59012
-43271

30) 48571
+59382

31) 58563
-38571

32) 58574
x48573

33) 48601
+11956

34) 48577
-47889

35) 68468
-55231

36) 47563
x17355

37) 38571
-19386

38) 97085
x49029

39) 49185
x99685

40) 48392
+29583

41) 49321
-22844

42) 63677
-22884

43) 67488
+99211

44) 55563
+92233

Testing Concentration - Math (2)

1) 39577 +69223	2) 87855 -47991	3) 98342 x28103	4) 85744 -19498
5) 59421 x99547	6) 59320 +99455	7) 48672 -10947	8) 59681 -20599
9) 69040 +99352	10) 68463 x40967	11) 49561 -29574	12) 89563 x99347
13) 48799 x30048	14) 49371 -10047	15) 69585 -47553	16) 94033 +50047
17) 48322 x99574	18) 95577 -77451	19) 57640 -28583	20) 58493 x33222
21) 22333 +97417	22) 48367 +86946	23) 57841 +11891	24) 32578 -19400
25) 78672 x39801	26) 57839 x48327	27) 48739 x68912	28) 59840 -39709
29) 58312 -48760	30) 78675 +90671	31) 78562 -29047	32) 48725 x18942
33) 37829 +28709	34) 89763 -18761	35) 67855 -27584	36) 41222 x97803
37) 12345 -11978	38) 79856 x56192	39) 19834 x15490	40) 58700 +89342
41) 57612 -28797	42) 57626 -35477	43) 89879 +88569	44) 78796 +69932

THE JOB OF COMPUTER PROGRAMMER

Converts the problem into a language the computer will understand.

A business programmer works with problems like payroll, inventories, shipments, and accounting.

An engineering programmer may work with tracking a spacecraft, running an automatic pilot on an airplane, or figuring the ingredients to go into a blast furnace.

Breaks down the steps of the problem into a flow chart.

Writes each step in a programming language that can be fed into the computer.

Looks at the results from the computer to correct for errors and improve efficiency.

Specific training for the job (includes college or trade school and on the job training): two to six years.

Interests: scientific and technical work; abstract and creative work.

Temperaments: likes planning the whole job.
likes making judgments based on numerical data.
likes making judgments based on what he sees.

Salary: $9,000 - $20,000.

TEACHING SUGGESTIONS FOR COMPUTER SIMULATION

Purpose: To acquaint students with the job of computer programmer
To show students some of the processes that the computer goes through in solving a problem or performing some function.

Procedure:
1. Pass out handout sheets.
2. Review the binary system. (Found in many math books)

ANSWERS:

1a) 9
1b) 7
1c) 27
1d) 32
1e) 65

2a) 1110 (7 + 7 = 14)
2b) 1001 (4 + 5 = 9)

3a) 100011 (7 X 5 = 35)
3b) 1101110 (10 X 11 = 110)

(Note: binary is used because the computer knows only two symbols--on and off. All numbers must be encoded into these two symbols and any words must also be encoded into these symbols.)

4) People may be afraid because they do not understand computers; because computers do not make mistakes (only programmers and parts fail); because the computer can never forget--unless a human operator or a power failure erases the information.

Go over the flow charts step by step. To follow a flow chart you must procede step by step, doing exactly what it says. If you come to a question you must take only one of the paths (depending on the answer to your question.

Notes on average grade flow chart:

1. All computers must be told to start.
2. To start counting we must tell the computer where to start.
3. To make a total we must tell the computer where to start adding.
4. TOTAL = TOTAL + GRADE JUST READ means that: to find the new total, add the old total to the grade just read into the computer.
5. To find the new count, add the old count to the number one.

Notes on robot flow chart: The only problem here should be the "count = Count + 1": to find the new count, add one to the old count.

The steps must be followed in the exact order. Go only with the arrows. What is interesting about this flow chart is that even if it is followed exactly, there are still many possibilities for the robot not picking up the pen (other objects in the way, hand not exactly centered over the pen, etc.) One of the students might want to spend the time to improve this program so that it will cover every possibility.

Discuss the qualifications and job description of the computer programmer.

COMPUTER SIMULATION

THE JOB OF COMPUTER PROGRAMMER

1. Change these numbers from binary to decimal:

   a. 1001

   b. 111

   c. 11011

   d. 100000

   e. 1000001

2. Add these numbers. Check your answer in decimal.

a.	111	b.	100
	$\underline{111}$		$\underline{101}$

3. Multiply these numbers. Check your answer in decimal.

a.	111	b.	1010
	$\underline{101}$		$\underline{1011}$

4. Why are some people afraid of computers?

5. Look at the flow chart to figure out your average grade. Follow it through step by step with the following data. This is the method that the computer must follow to solve this problem:

   DATA: First grade = 95, Second grade = 80,
   Third grade = 45, Fourth grade = 90

6. Look at the flow chart to figure out the area of a circle. Use both sets of the following data and the chart to find the areas:

   DATA: Circle Circumference = 6.28

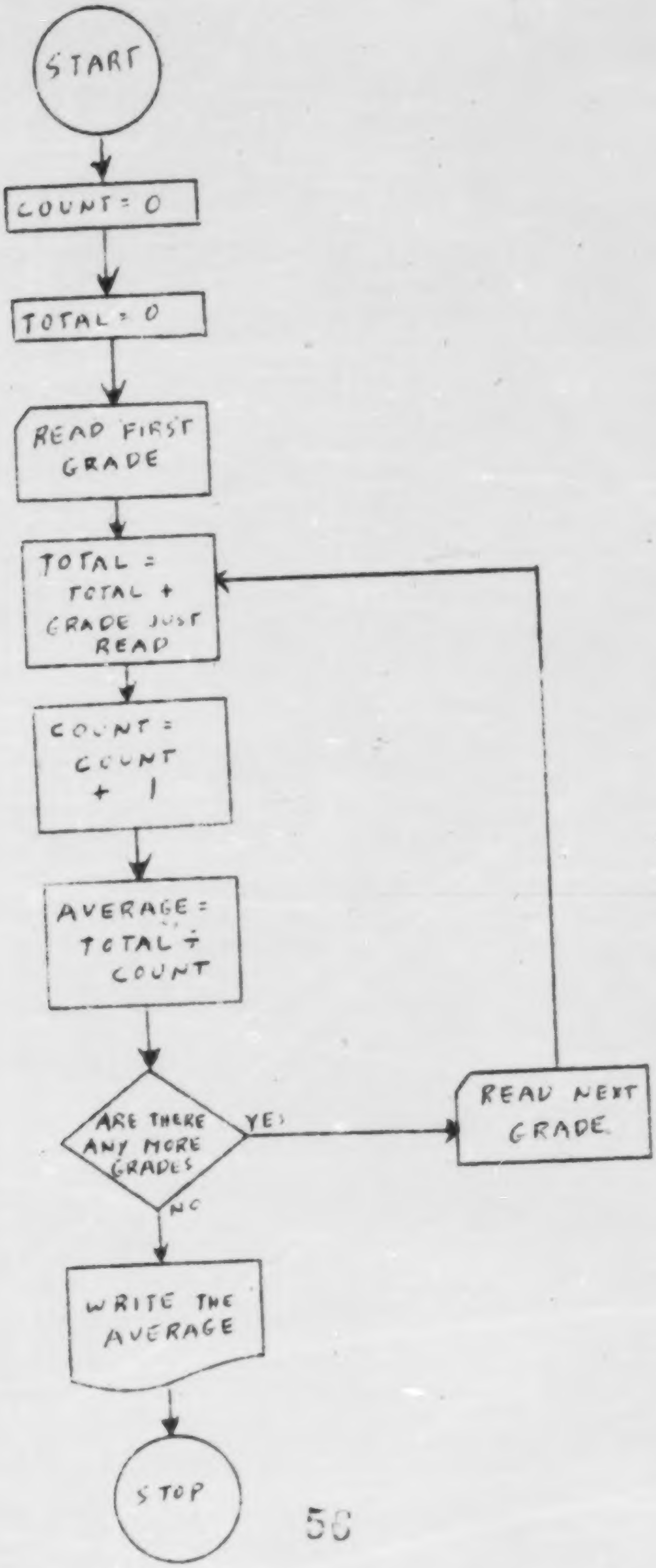
   DATA: Circle Diameter = 20

7. Place a pen on the desk in front of you. Follow the third flow chart step by step to pick up the pen. This is the type of flow chart that would have to be written to give instructions to a robot. How big a memory would the robot have to have, to be given enough instructions to be a housemaid or an automobile mechanic?

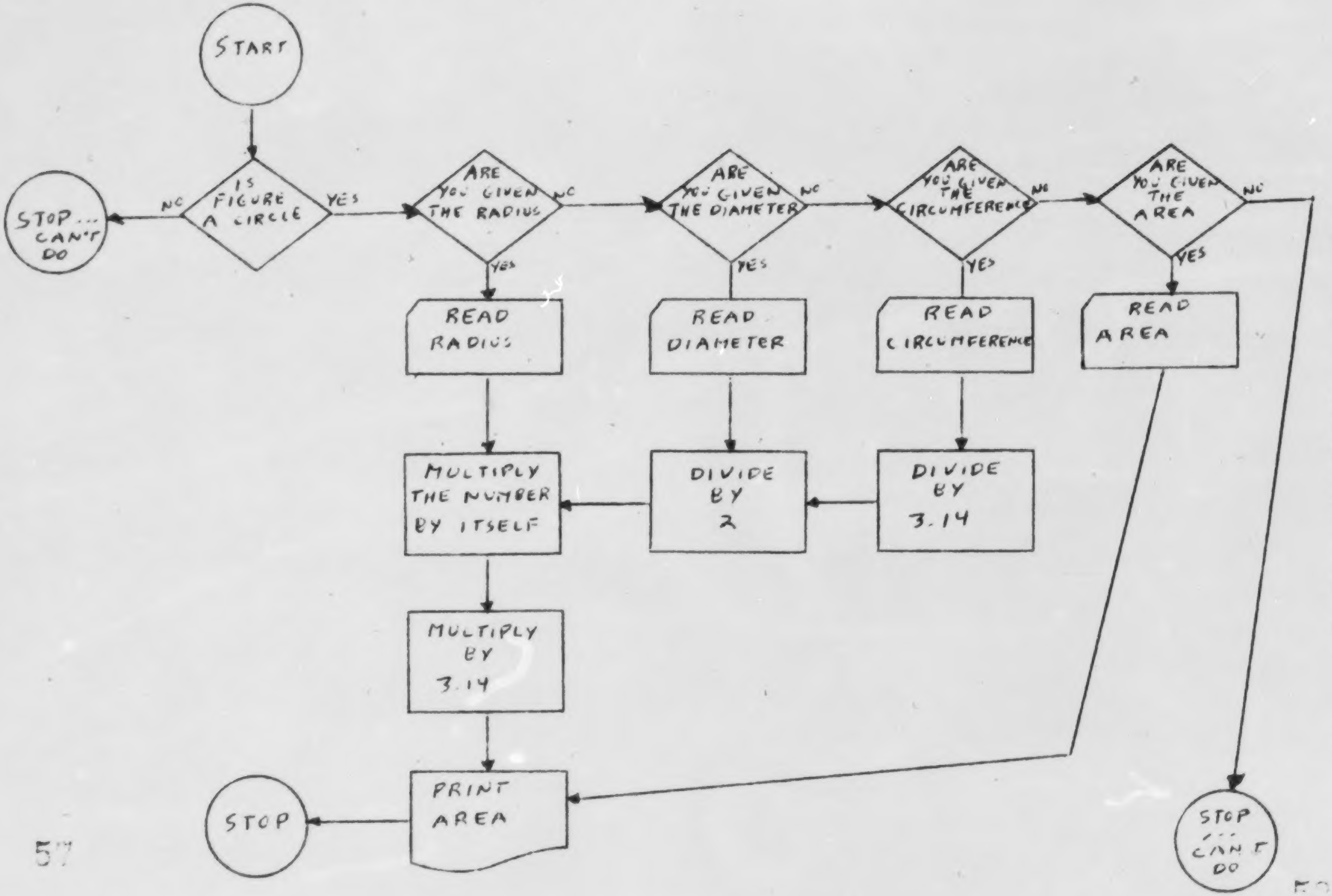
8. Write your own flow chart. Some suggestions: to get two robots to shake hands (try it out on your partners), to get a robot to put on a hat, to break open an egg, to play shortstop.

(COMPUTER SIMULATION - PG 2)

FLOW CHART TO FIGURE OUT YOUR AVERAGE GRADE


START
COUNT = 0
TOTAL = 0
READ FIRST GRADE
TOTAL = TOTAL + GRADE JUST READ
COUNT = COUNT + 1
AVERAGE = TOTAL ÷ COUNT
ARE THERE ANY MORE GRADES
YES
READ NEXT GRADE
NO
WRITE THE AVERAGE
STOP

FLOW CHART TO FIGURE OUT THE AREA OF A CIRCLE


START
IS FIGURE A CIRCLE
NO
STOP... CAN'T DO
YES
ARE YOU GIVEN THE RADIUS
NO
ARE YOU GIVEN THE DIAMETER
NO
ARE YOU GIVEN THE CIRCUMFERENCE
NO
ARE YOU GIVEN THE AREA
NO
YES
YES
YES
YES
READ RADIUS
READ DIAMETER
READ CIRCUMFERENCE
READ AREA
MULTIPLY THE NUMBER BY ITSELF
DIVIDE BY 2
DIVIDE BY 3.14
MULTIPLY BY 3.14
PRINT AREA
STOP
STOP ... CAN'T DO

COMPUTER SIMULATION -PG 3

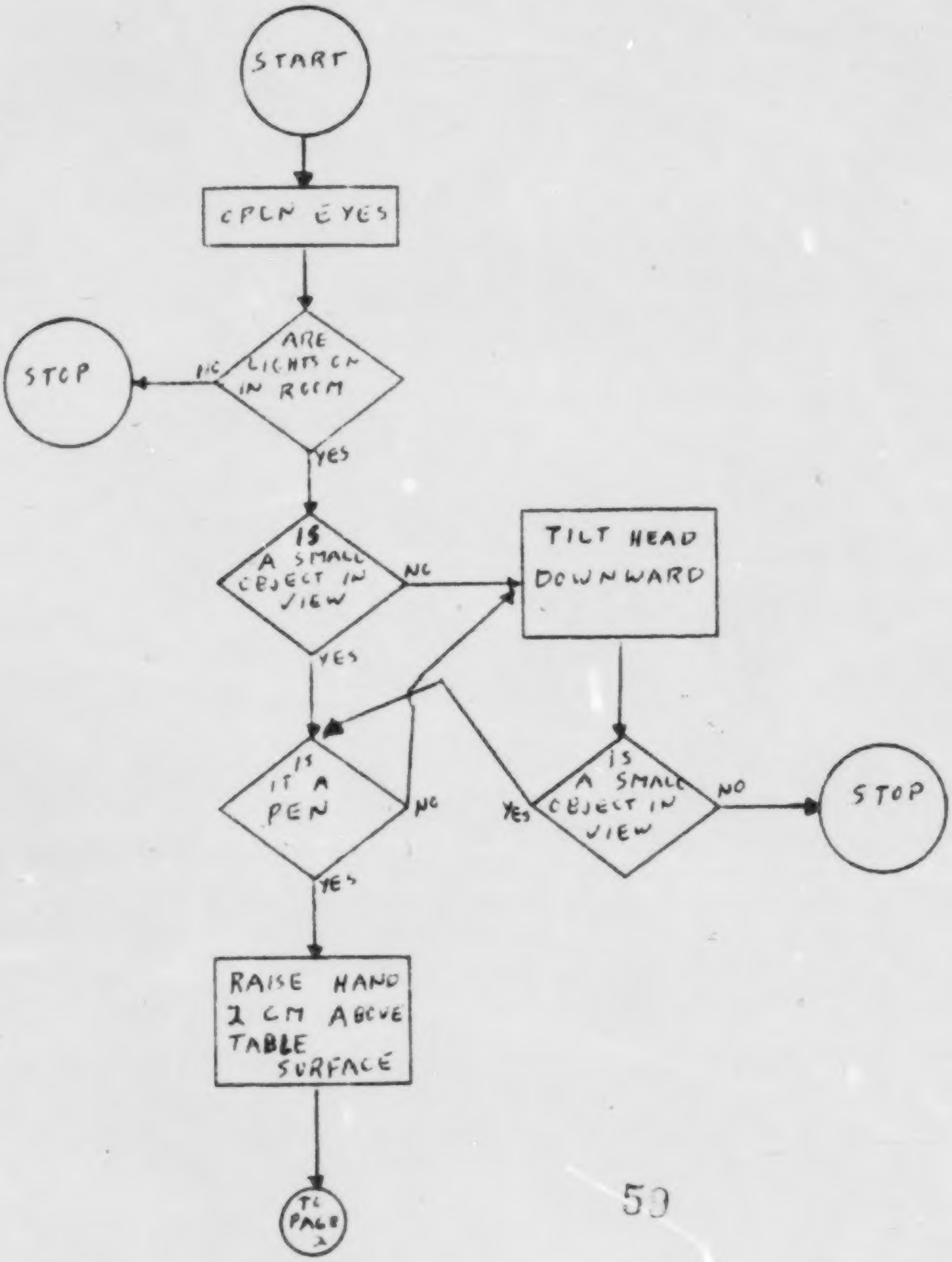
FLOW CHART TO TELL A ROBOT TO PICK UP A PEN (Computer simulation pg. 4)

(THE JOB OF A COMPUTER PROGRAMMER)

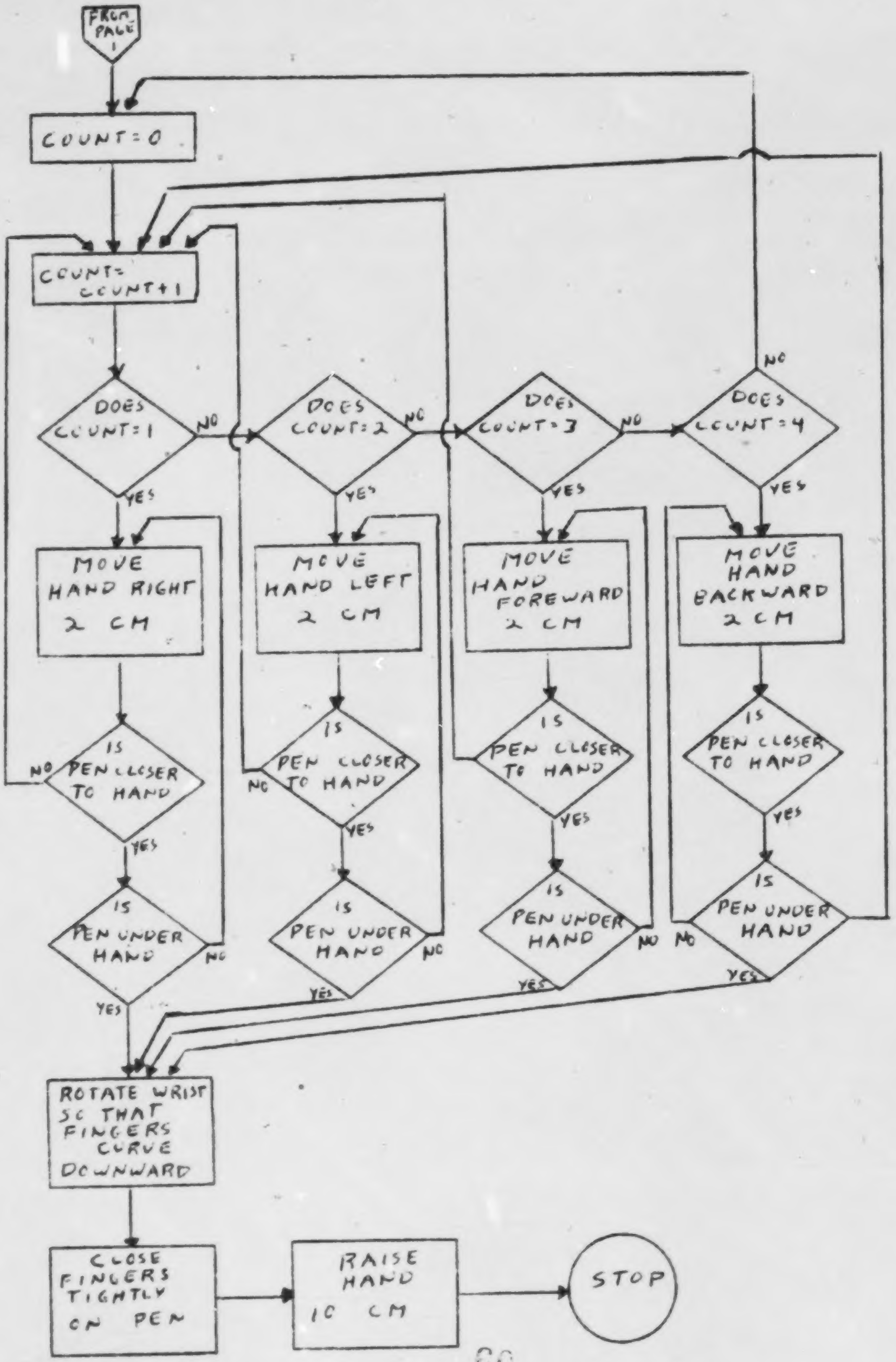
This program is vastly simplified. It assumes that the robot will do such things as:
1) Tilt its head only so far
2) Recognize a pen lying in any direction on the table
3) Can measure distances visually
4) Can shut itself off if it gets into trouble

In reality, all of these things would have to be taken into account when designing a real robot.

To start out, close your eyes and have your partner place a pen somewhere on your desk in plain view. Eliminate all other objects from the desk.


START
OPEN EYES
ARE LIGHTS ON IN ROOM
NO
STOP
YES
IS A SMALL OBJECT IN VIEW
NO
TILT HEAD DOWNWARD
YES
IS IT A PEN
NO
YES
IS A SMALL OBJECT IN VIEW
YES
NO
STOP
RAISE HAND 1 CM ABOVE TABLE SURFACE
TO PAGE 2

ROBOT FLOW CHART (CONT) (COMPUTER SIMULATION - PG 5


FROM PAGE 1
COUNT=0
COUNT= COUNT+1
DOES COUNT=1
NO
YES
DOES COUNT=2
NO
YES
DOES COUNT=3
NO
YES
DOES COUNT=4
NO
YES
MOVE HAND RIGHT 2 CM
MOVE HAND LEFT 2 CM
MOVE HAND FOREWARD 2 CM
MOVE HAND BACKWARD 2 CM
IS PEN CLOSER TO HAND
NO
YES
IS PEN CLOSER TO HAND
NO
YES
IS PEN CLOSER TO HAND
YES
IS PEN CLOSER TO HAND
YES
IS PEN UNDER HAND
NO
YES
IS PEN UNDER HAND
NO
YES
IS PEN UNDER HAND
NO
YES
IS PEN UNDER HAND
NO
YES
ROTATE WRIST SO THAT FINGERS CURVE DOWNWARD
CLOSE FINGERS TIGHTLY ON PEN
RAISE HAND 10 CM
STOP

THE JOB OF ANTHROPOLOGIST

Studies the origin of man.

Gathers data on the structure of the human body, the weapons, the tools, the pottery, the clothing and the customs of modern and ancient man.

Studies the races of man and where they are located on earth.

Studies human fossils to try and determine human evolution.

Studies the growth patterns, the sexual differences, and the aging of different human cultures.

Tries to solve race problems, worker problems, public health problems, and social problems of many kinds, based on data he or she has discovered.

Studies the variations among modern men.

Specific training for the job (on the job training and college courses): six to ten years.

Interests: communicating with people; scientific and technical work; abstract and creative work.

Temperaments: likes planning the whole job.
likes making judgments based on what he sees.
likes making judgments based on numerical data.

Salary: $12,000 - $25,000.

TEACHING NOTES: ANTHROPOLOGICAL DIG

Purpose: To acquaint students with the job of an anthropologist.
To teach students the characteristics of fossils.

Procedures:

1. Discuss the questions. It is helpful to have on hand pictures from encyclopedias or elsewhere of the human skeleton, human muscles and if possible a monkey skeleton picture.
2. Anthropologists have made educated guesses of all 16 characteristics based on either the fossil remains or the artifacts left by prehistoric man. eg.

   skin color - based on the climate at the time (dark skin for brightly lit climates for hunting ease, and light skin for vitamin D production in cooler climates.)

   two or four limbed - based on how the bones are put together (a four legged animal has limbs of equal size) (a four legged animal cannot stand because its internal organs would not be supported by the coccyx as they are in man).

   hair - based on modern examples of hair growth in primates in general and in primitive peoples still living.

   religion - based on artifacts or lack thereof and in observing primitive peoples still living.

   heartrate - physiologically based on body size.

3. Discuss the role of the anthropologist.
4. Anthropological dig - this is a purely fictitious drawing so the answers are left up to your imagination. Some comparisons might be the evolution of society from scavengers to hunters to herdsman; the evolution of a metal culture; the evolution of everything as an enemy to only his fellow man being an enemy; the development of a religion.

   Possible approaches might include asking the students to make up short stories of each level or having them design fictitious digs of their own on transparancies and make a guessing game of the assignment.

   More advanced work might include research topics on the actual information discovered on one of the 16 characteristics from the previous page.

References: Time-Life Science Library "Early Man"
"The Color of Man" film owned by the board

CHARACTERISTICS OF HUMAN FOSSILS

THE JOB OF AN ANTHROPOLOGIST

Which of the following characteristics can be determined by fossil remains:

1. Height of the human
2. Skin color
3. Brain size
4. Number of teeth
5. Intelligence
6. Methods of communication
7. Types of food
8. Weapons
9. Whether or not fire was used
10. Whether the human used two or four limbs for walking
11. Whether the human had hair
12. Religion
13. Heartrate
14. Social groupings--did they live in families, tribes, etc.
15. Types of housing
16. Artwork

Draw a picture of your hand and arm.

Draw a picture of your hand and arm bones (feel carefully for the hard parts or look at a skeleton).

Is it possible to tell something of the shape of the flesh based solely on the bone arrangement?

Draw a picture of your partner's head (pay particular attention to teeth and soft spots).

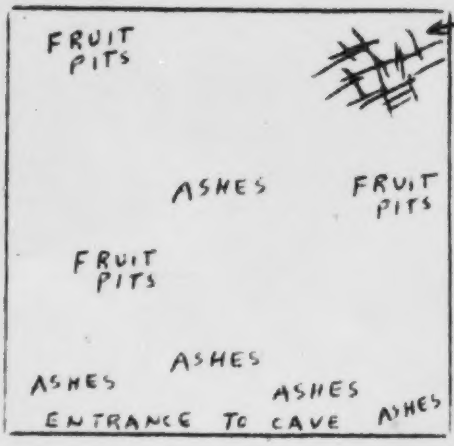
Draw a picture of the skeleton of your partner's head. Where is there a lot of muscle? A little muscle?

Use the skeleton provided (or picture) to suggest what the original animal would have looked like.

ANTHROPOLOGICAL DIG (THE JOB OF AN ANTHROPOLOGIST

Describe the life style of each of the three cave peoples below. This is a single cave which has been excavated and the remains of three different cultures have been discovered on top of each other. You should try to figure out each's eating habits, sleeping habits, social customs, religion, and any other facts you can based on what has been discovered in the 20th century:

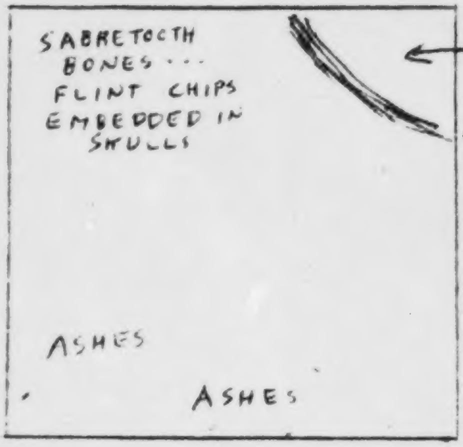
Bottom Level = Carbon Dated ashes indicate 100,000 years old


FRUIT PITS
ASHES
FRUIT PITS
FRUIT PITS
ASHES
ASHES
ASHES
ASHES
ENTRANCE TO CAVE

DECOMPOSED CARBON FRAGMENTS → MIGHT BE TWIGS

ALL ASHES CONTAIN THE BONES OF ASSORTED SMALL ANIMALS LIKE RABBITS, SQUIRRELS, ETC.
BONES ARE ALL INTACT (ANIMALS MUST HAVE DIED OF DISEASE)

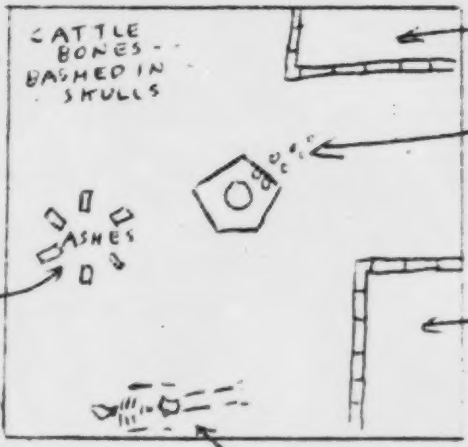
Middle Level = 25,000 years old


SABRETOOTH BONES ... FLINT CHIPS EMBEDDED IN SKULLS
ASHES
ASHES

COMPACTED MUD MOUND

SMALL STONE WALL

Top Level = 5,000 years old


CATTLE BONES - BASHED IN SKULLS
ASHES

Also contains copper fragments

COMPACTED MUD SQUARED OFF STONES

STACK OF ROUNDED STONES APPARENTLY KNOCKED OVER → SURROUNDED BY A PERFECT PENTAGON OF SMALL PEBBLES

COMPACTED MUD SQUARED OFF STONES REMAINS OF ANIMAL SKINS

HUMAN SKELETON WITH FLINT IN SKULL

THE JOB OF ELECTRICIAN

Installs and repairs wiring and electrical fixtures in buildings.

Helps plan new electrical wiring so that it will not be a safety hazard.

Installs the electrical conduit, pulls wires through, and connects the wires at the proper place.

Connects lights, fuse boxes, circuit breakers, switches, etc.

Tests circuit with electrical instruments to insure safety.

Repairs faulty electrical wiring in both buildings and in electrical equipment.

Specific training for the job (includes specific, related high school courses, trade school courses, and on the job training): one to six years.

Interests: working with physical objects; working with machines; working with something that is tangible and visibly productive.

Temperaments: likes making judgments based on numerical data.
likes precise standards for the work.

Salary: $10,000 - $25,000

THE JOB OF RADIO REPAIRMAN

Repairs radios, record players, tape recorders, and other sound equipment.

Checks out the piece, to try and find the fault, using various meters such as voltmeters, ammeters, etc.

Uses a soldering iron to repair loose connections.

Replaces broken parts such as tubes and transistors.

Adjusts equipment for maximum efficiency.

Specific training for the job (includes specific, related high school courses, trade school courses, and on the job training): one to six years.

Interests: working with physical objects; working with machines;
working with something that is tangible and visibly productive.

Temperaments: likes making judgments based on numerical data.
likes precise standards for the work.

Salary: $8,000 - $18,000

TEACHING SUGGESTIONS
FOR "PRACTICAL ELECTRONICS WORKSHEET"

Purpose: To acquaint students with the jobs of electrician and radio repairman.
To give students some practical knowledge of electricity that they can use at home.

Page 1 answers:

1. Two wires touching creating a short; a wire broken, creating an "open", a weak or corroded battery; a broken light (open).
2. Corroded battery terminal, weak battery, obvious short or open.
3. Burned out light, fuse blown, wire shorted, not plugged in, wire has a break inside (need a continuity tester to find--put the suspected wire in a lightbulb and battery circuit).
5. Fuses are different because they carry different loads.
6. Turn off breaker switch, stay out of water, wear good, insulated shoes (normal, intact, shoes without metal soles), touch fuse box with one hand if possible.
7. eg. in bathtub, you touch alternating current and the current flows through you to the water (anytime you touch water or metal and house current at the same time).
8. Stimulates muscles to contract (hand holds on to a hot wire and the heart beats erratically).

Page 2 and 3 answers

A. The path of current around in a circle.
B. The current takes a short cut through two, touching, bare wires causing the wire to overheat (may start fires, or cause burns).
C. + and - on the battery (the projecting knob is the plus).
D. Circuit has been broken open--no current flows.

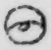
FIND THE TROUBLE: This may be assigned as a worksheet or if the parts are available, it may be given as a discovery lesson. Warn students of shorts -- they will wear down the batteries, and may cause a burn if left on too long.

1. Will work: trace out the path of the current from the battery, through the light bulb and back to the opposite terminal of the battery. Note where the wires cross but do not touch.
2. Won't work: trace all possible paths of current. Start with the top terminal of the battery and end at the bottom terminal of the battery. Two paths go only through wires without going through the light (a short circuit).

FIND THE TROUBLE continued..

3. Will work--bottom battery only is being used.
4. Yes--brightly because the batteries are stacked in series.
5. No--batteries opposed (this is why it is important to load the batteries properly into a flashlight).
6. Yes--batteries in parallel (current comes from all three batteries at the same time and returns to all three at the same time)--light will stay on for a longer time.
7. Yes--very, very bright light.
8. Yes--middle battery is not part of the circuit because it is missing one connection.
9. No--batteries opposed.
10. Yes--top battery is not being used.

is the symbol for a battery.

 is the symbol for a light bulb.

11. Yes
12. No--open circuit.
13. Yes
14. Yes--dimly since two lights are using up the batteries power
15. Yes
16. Yew--dimly (note - wires are crossed without touching)
17. Yes
18. Yes
19. No--short
20. Yes
21. No--open
22. Yes--left battery is not in the circuit
23. No--short
24. Yes--two batteries are opposed and will drain each other but the third battery will still provide some power.
25. No--left hand branch will act as a short to the bigger voltage of the two batteries.
26. No--batteries opposed.

Discuss the jobs of electrician and radio repairman. What else must they be able to do.

Page 4: The completion of this page depends on obtaining the equipment:

1. Make sure parts are clean. Make a good mechanical connection (use pliers to squeeze or wrap wires together) heat the wires, not the solder, with the soldering iron when the wires are hot, touch the wires with the solder and allow just enough solder to flow to surround the connection.
2. When the piece is to be moved (as in radios, TV's, tape recorders) and the joint must be permanent; if small currents will be traveling through the wires and a good electrical connection is needed.

NOTE: Equipment can be purchased locally at Radio Shack or Olson Electronics.

PRACTICAL ELECTRONICS WORKSHEET

THE JOBS OF ELECTRICIAN AND RADIO REPAIRMAN

1. Name four things that you could check for if your flashlight was not working.

2. Name three things that you could check for if your transistor radio was not working.

3. Name four things that you would check for if a light would not turn on at home.

4. Where is the fusebox in your home?

5. How many different types of fuses do you have in it? Why are they different? How do you change them?

6. What safety precautions should you follow when changing a fuse?

7. Name three ways that you can ground yourself and become part of an electrical circuit.

8. Why is house current so dangerous to the body?

ELECTRICIAN TROUBLESHOOTER

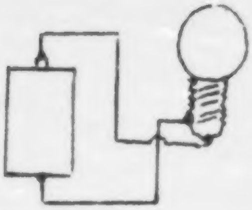
A) What is a circuit?

B) What is a short circuit?

C) What is polarity?

D) What is an open?

FIND THE TROUBLE: Which of the following will work and which won't? Why? Assume each individual part is in working order.



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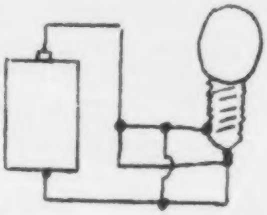

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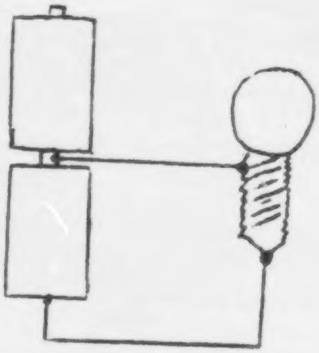

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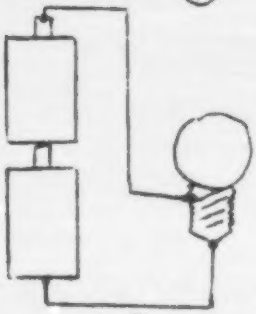

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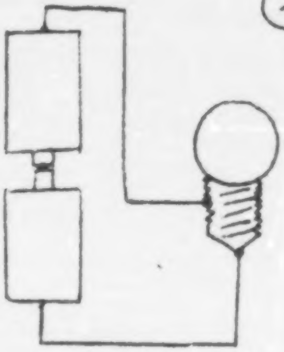

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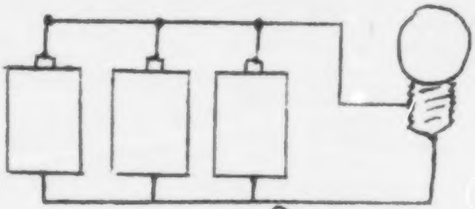

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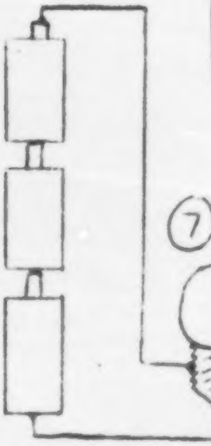

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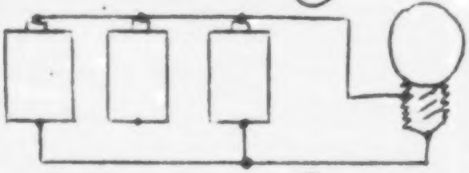

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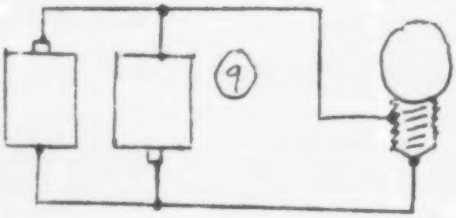

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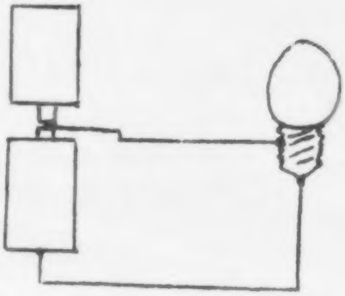

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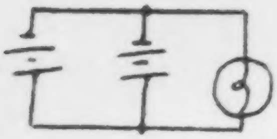
FIND THE TROUBLE (Cont.) (THE JOBS OF ELECTRICIAN AND RADIO REPAIRMAN)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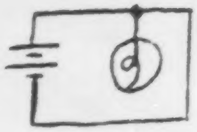
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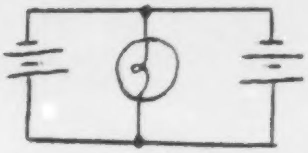
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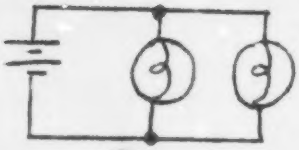
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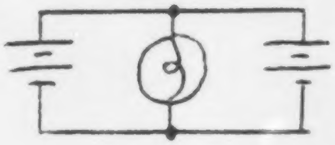
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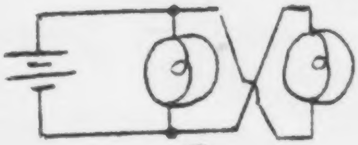
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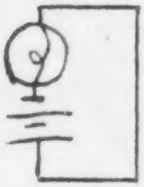
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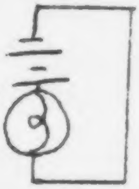
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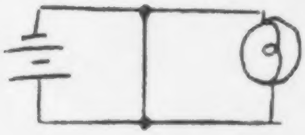
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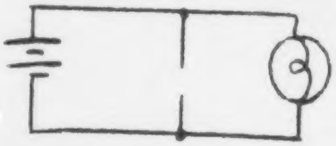
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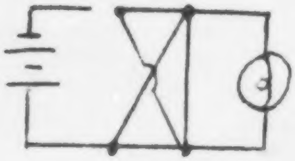
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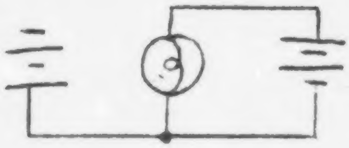
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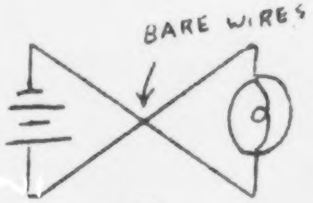

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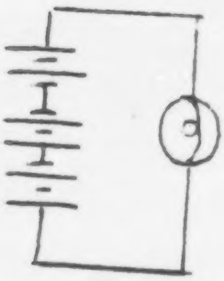
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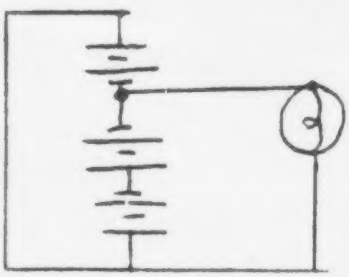
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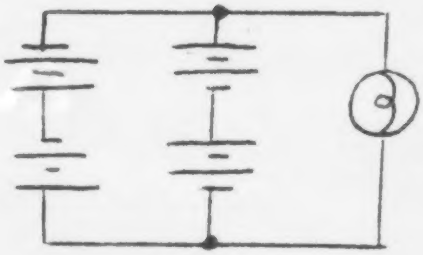
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SOLDERING PRACTICE

THE JOBS OF ELECTRICIAN AND RADIO REPAIRMAN

1. List the steps in making a good solder joint.

2. When is soldering preferable to other methods of joining wires.

4. Solder a battery case, wires, and a light socket together so that the light will work.

VOLTAGE AND CONTINUITY MEASUREMENTS

5. Use the neon light tester to find out which sockets in the room are good. Name them:

6. Use the continuity tester to find out which wire is broken.

7. Use the voltmeter to find out which batteries are good.

8. Use a transistor tester to find out which transistor is good.

THE JOB OF CITY PLANNER

Develops far-reaching plans for cities, counties and metropolitan areas.

Gathers data on the reasons behind land use--why people only live in certain places.

Prepares reports on where people now live, how much they earn, their ethnic background, etc.

Talks with local officials to recommend changes in the use of the land.

Recommends where transit should be built, the location and types of recreation, the best locations and design of public buildings, etc.

Recommends new zoning laws to encourage or discourage housing and business in certain areas.

Specific training for the job (on the job training and college courses): six to ten years.

Interests: pride in his work; communicating with people; scientific
and technical

Temperaments: likes variety in the job.
likes planning the whole job.
likes dealing with people.
likes making judgments based on what he sees.
likes making judgments based on numerical data.
likes precise standards for his work.

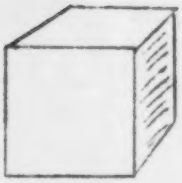
Salary: $12,000 - $30,000.

MODULAR CONSTRUCTION

(THE JOB OF A CITY PLANNER)

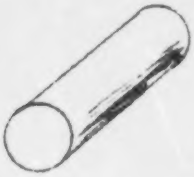
Use one of the following basic forms to completely design a city. The only thing that may be added is doors and windows:

A



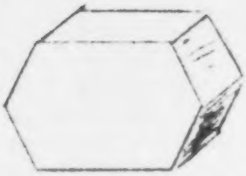
CUBE

B



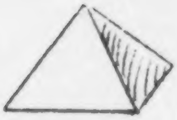
CYLINDER

C



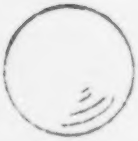
HEXAGONAL BLOCK

D



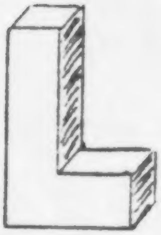
PYRAMID

E



SPHERE

F



"L - SHAPE"

BUILD A SMALL PART OF YOUR DESIGN.
WHAT PROBLEMS DID YOU ENCOUNTER?
READ THE JOB SUMMARY OF A CITY PLANNER

THE JOB OF AUTO REPAIRMAN

Repairs automobiles, buses and trucks.

Examines vehicle and diagnoses the trouble using experience, technical manuals, and various instruments.

Disassembles parts and checks for wear.

Repairs or replaces parts such as pistons, gears, valves, etc.

Rebuilds parts such as cylinder blocks using machine shop equipment.

Mends damaged body and fenders.

Rewires electrical system.

Specific training for the job (includes specific, related high school courses, trade school courses, and on the job training): one to six years.

Interests: working with physical objects; working with machines;
working with something that is tangible and visibly productive.

Temperaments: likes making judgments based on numerical data.
likes precise standards for the work.

Salary: $10,000 - $25,000

TEACHING SUGGESTIONS FOR "CAR TROUBLE"

Purpose: To acquaint students with the job of auto mechanic. To provide some basic knowledge into how car parts work (and fail to work).

Procedure:

A. Discuss the job of auto mechanic.

B. Pass out worksheet.

ANSWERS:

2. You would not be warned in time and you might run out of gas.
3. No fuel = no travel.
4. Engine would overheat unless traveling over 40 mph; battery would run down because the alternator or generator would not be turning.
5. NO BRAKES in at least the front or the back (or both) you might go into a skid or fail to stop.
6. Car would stall--no air to burn the fuel.
7. Poor gas mileage.
8. Wouldn't start.
9. Battery would run down and eventually you couldn't start the car.
10. Stalls, runs hard, won't accelerate--the carburetor mixes the proper amount of fuel under all conditions (too much fuel means stalling, hard running because one or more cylinders does not fire, and a lot or air pollution coming from the car.
11. Eventually car would overheat when the water in the radiator got too low.
12. Engine would overheat and bind up due to friction.
13. Couldn't shift gears.
14. Poor acceleration, high exhaust emissions because the fuel is not being ignited at its optimum point in the compression cycle.

C. Go outside to look underneath the hood of one or more cars (with permissions of the owners), identify the parts, and find evidence for poor maintainance (leaks around battery, oil and water leaks, dirty carburetor, blackened exhaust pipe, etc.

D. Have students go home and identify the parts on the engines of the family's or neighbor's car.

CAR TROUBLE

THE JOB OF AUTO MECHANIC

1. Name three things that have broken on your family's or a friend's car.

Describe what would happen if:

2. ...the gas gauge broke.

3. ...the fuel pump broke.

4. ...the fan belt broke.

5. ...the brake line broke.

6. ...the air filter clogged.

7. ...one spark plug failed.

8. ...the battery failed.

9. ...the generator failed.

10. ...the carburetor was misadjusted.

11. ...the radiator leaked.

12. ...the oil was low.

13. ...the transmission fluid was low.

14. ...the timing was off.

THE JOB OF SOCIOLOGIST

Studies human groups and cultures.

Collects data on ethnic minorities, social classes and social change.

May study the causes of crime.

May study the effectiveness of group work in industry.

May study the effectiveness of prisons in preventing crime.

May study the causes and effects of poverty and racial discrimination.

May study the problems of the city: crowding, urban blight, mass transit, voting patterns, etc.

Specific training for the job (on the job training and college courses): six to ten years.

Interests: communicating with people; scientific and technical work; abstract and creative work.

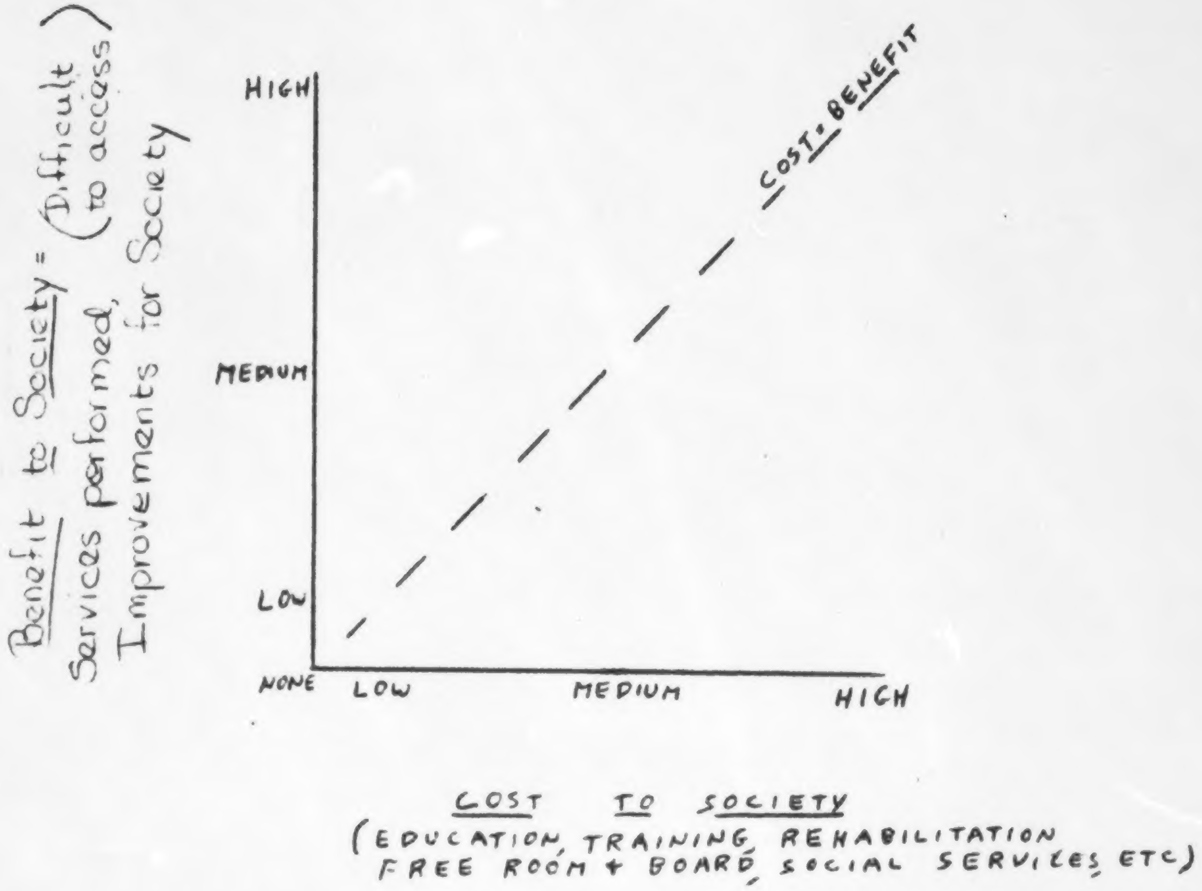
Temperaments: likes planning the whole job.
likes making judgments based on what he sees.
likes making judgments based on numerical data.

Salary: $11,000 - $30,000

POPULATION RATING
(THE JOB OF SOCIOLOGIST)

Rate the following people on the graph below in terms of their usefulness to society and their cost to society:

1) Ditch digger
2) Mayor of a large city
3) Social worker
4) Chronic alcoholic
5) Criminal
6) Mental patient
7) Housewife
8) Cancer Researcher
9) College dropout
10) Clergyman
11) President of General Motors
12) Four others of your own choice



WHERE WOULD YOU RATE ON THIS GRAPH?
READ THE JOB SUMMARY OF A SOCIOLOGIST.

THE JOB OF MICROBIOLOGIST

Studies the growth and development of bacteria.

Tries to study how much food, heat, air, and moisture they need to grow.

Identifies the bacteria based on their shapes, their movements, their color, and their growth habits.

Tries to find out how they affect living plants and animals.

Tries to find out how to prevent the spoilage of meats, canned foods and dairy products.

Tests out new drugs to see which, if any, will kill the bacteria, which cause human, animal or plant disease.

Experiments to find new beneficial products from bacteria, such as new antibiotics or faster decomposition of wastes.

Specific training for the job: three to six or more years of college.

Interests: working with physical objects; scientific and technical work; abstract and creative work.

Temperaments: likes variety in the job.
likes making judgments based on numerical data.
likes making juedments based on what he sees.
likes precise standards for the work he or she does.

Salary: $8,000 - $20,000

GROWING BACTERIA (JOB OF A MICROBIOLOGIST)

COAT PLATE FIRST WITH BACTERIA eg. FROM DECAYING BEANS

DAYS	CONTROL - COVERED AGAR PLATE	CONTROL - UNCOVERED AGAR PLATE	CONTROL - PLATE WITH BACTERIA - 25°C	PLATE, BACTERIA + REFRIGERATED	BACTERIA FROM YOGHURT ON (37°C) AGAR	FROM MILK 37°C	FROM SAUERKRAUT 37°C	DECAYING BEANS ON AGAR (37°C)	PICKLE JUICE ON AGAR (37°C)	FINGERPRINT ON AGAR (37°C)	ROOM DUST ON AGAR (37°C)	UV LIGHT THEN (37°C)	IODINE THEN (37°C)	MOUTHWASH 1	MOUTHWASH 2	DISINFECTANT 1	DISINFECTANT 2	SOAP 1	SOAP 2
1																			
2																			
3																			
4																			
5																			
6																			

TEACHING SUGGESTIONS FOR GROWING BACTERIA

Purpose: To acquaint students with the job of microbiologist. To give students some understanding as to the conditions under which bacteria grow.

Materials: sterilized agar plates; purchase or make up. For the agar, mix 20g of solid agar, 30 g of beef bouillon cube, into one liter of boiling water. Allow to dissolve. Cool slightly and pour into glass petri dishes. Autoclave.

Notes on procedures: This is mostly an open-ended experiment so the plates themselves can be varied to suit the class. Above all it must be remembered that every plate with bacteria growing on it must be treated as possibly pathogenic--DO NOT ALLOW STUDENTS TO OPEN THE PLATES AFTER COLONIES HAVE BEEN SPOTTED.

One interesting way to see the effects of the mouthwashes and disinfectants is to soak these up in a small, one quarter inch circle, of blotting paper and place just this circle on the agar. If the agar has been rinsed with a solution of decaying beans, the inhibition of bacterial growth should be seen as a clear area around the blotting paper.

THE JOB OF AGRONOMIST

Conducts experiments on crops such as cotton, tobacco, and cereal.

Tries to develop new methods for growing the crops.

Tries to grow plants for specific soils and for specific climates.

Tries to discover the best methods for planting, cultimating and harvesting.

Tries to improve the quantity and quality of the yield.

Tries to develop methods to control weeds, crop diseases and insect pests.

Specific training for the job: three to six or more years of college.

Interests: working with physical objects; scientific and technical work; abstract and creative work.

Temperaments: likes variety in the job.
likes making judgments based on numerical data.
likes making judgments based on what he sees.
likes precise standards for the work he or she does.

Salary: $8,000 - $25,000.

RESULTS OF SOIL TESTS (THE JOB OF AN AGRONOMIST)

Choose one water source= Tap water, distilled water, rain water, fertilizer and water, etc. Keep soil slightly moist (include Drainage).

The class should choose one type of seed. The seed should be planted as deep as it is big (1/2" seed planted 1/2" deep etc.)

Read the job summary of an agronomist.

SOIL TYPE	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10	DAY 11	DAY 12
100% HUMUS												
100% CLAY												
100% SAND												
100% WATER												
50% SAND 50% CLAY												
50% SAND 50% HUMUS												
50% CLAY 50% HUMUS												
33⅓% CLAY 33⅓% SAND 33⅓% HUMUS												
20% CLAY 80% SAND												
80% CLAY 20% SAND												
10% HUMUS 45% SAND 45% CLAY												

THE JOB OF FOOD CHEMIST

Experiments on the chemistry of foods.

Tries to develop new foods, new preservatives, and new flavorings.

Studies the effects of preservatives on flavor and vitamin content.

Tests food to make sure they have not become contaminated.

Tests food for the Food and Drug Administration.

May try to improve a certain food: such as a wine, a beer, a cheese, etc.

Specific training for the job: three to six or more years of college.

Interests: working with physical objects; scientific and technical work; abstract and creative work.

Temperaments: likes variety in the job.
likes making judgments based on numerical data.
likes making judgments based on what he sees.
likes precise standards for the work he or she does.

Salary: $8,000 - $20,000.

TEACHING SUGGESTIONS
FOR A PRE-VACATION CHEMISTRY EXPERIMENT

Purpose: To acquaint the student with the job of food chemist.
To have some fun in preparing food.

Materials: Everything except the burner and ring stand apparatus MUST BE CLEAN; Mentha piperita extract is peppermint oil.

Notes on procedure: THE STUDENTS WILL BE MAKING CANDY CANES. Help the students understand some of the terminology. Sufficient time should be allowed for the procedure. If the groups are made large enough (three or four), the procedure reviewed the day before, and the work is divided among the group, it is possible to finish in one period.

Discuss the job of the food chemist the day before.

A PRE-VACATION CHEMISTRY EXPERIMENT

THE JOB OF A FOOD CHEMIST

Purpose: To observe the effect of temperature and twisting on the visible shape of certain groups of molecules.

Apparatus: 600 ml beaker, graduated cylinder, bunsen burner, stirring rod, iron ring, wire gauze, ring stand, 150°C thermometer (make sure the beaker, the graduated cylinder, the stirring rod, and the thermometer are clean--very clean).

Chemicals needed: (keep clean) 150 ml of sucrose, 40 ml of starch, 1 ml of potassium hydrogen tartrate, 40 ml of water, red food color, 2 ml of extract from the plant, *Mentha piperita*.

Procedure: Using a 600 ml beaker and a stirring rod, thoroughly mix 150 ml of sucross $C_{12}H_{22}O_{11}$, 40 ml of starch, $(C_6H_{10}O_5)_n$, 40 ml of H_2O, and 1 ml of potassium hydrogen tartrate, $KHC_4H_4O_6$.

When a uniform mixture is achieved, subject the mixture to intense heat from the nearest source of burning methane, CH_4. When the mixture starts to boil, turn down the flame. During the operation (approximately 20 minutes), avoid stirring the mixture. When the thermometer reaches 132°C, a sufficient quantity of heat has been added. Remove the burner.

Place a piece of paraffin-coated paper on top of a piece of newspaper. Coat the paraffin on top with a light layer of hydrogenated vegetable oil. Also melt by friction some of the same vegetable oil in the palms of your hands. Add plant extract (about 2 ml) to the cooking mixture and stir. Pour one half of the mixture on the paraffin-coated paper. To the portion of the mixture remaining in the beaker, add 1 ml of red coloring, mix, and then pour the red mixture onto another piece of paraffin-coated paper treated in the same way as the first.

When the mixture has cooled, work it and continue to stretch it until the honey-colored portion becomes white. Work and stretch the red mixture (separately) and equal amount of time. Divide each color into four, 20 cm segments. When ready combine results by twisting a red and a white piece together. Place the distorted object on a clean section of the paraffin coated paper and shape in the form of a J-tube. Likewise twist the remaining three pairs. Allow this to remain undisturbed until the molecules become adjusted to this position.

Results and Conclusions:

TEACHING SUGGESTIONS FOR THE HOME COOKING PROJECT

Purpose: To acquaint students with the job of a food chemist.
To show students that cooking is a science.

Materials: None, unless cooperation with the home economics teacher can be obtained in order to perform this in the school building.

Notes on the procedure:

1. The students might bring the partially cooked samples back to class to be tested. Except for the food which gets tested by Benedict's solution, all the rest of the food in this and the remaining experiments is perfectly edible (although it might have to be re-cooked) if the utensils are kept clean.

   These experiments might be assigned as extra credit, but if the students are given a choice as to which experiments they would like to do, there should be no reason why the assignment can't be made a requirement.

   To avoid sloppy technique, it might be best for your class to specify exactly how many different trials would be required and the format of the data, observations, and conclusions.

2. Read the job description of the food chemist. Make a list of the kinds of experiments that would have to be carried out to sell any one product (eg. percentage of ingrediants, cooking time in continuous ovens, etc.)

3. Extra research: food additives—how they are made, in what foods they are contained, what they do to man, etc.

HOME COOKING PROJECT

A series of short experiments to show the relationship between science and cooking.

THE JOB OF A FOOD CHEMIST

1. Testing for glucose:

   Bake bread, cookies, or potatoes for varying lengths of time. Test a small sample of each for sugar using the Benedict's test. The further the color change toward the red, the more sugar is present.

2. Effect of enzymes on foods:

   Investigate the effect of meat tenderizer or fresh pineapple juice on protein-containing foods such as meat or jello. Leave the enzyme on the food for varying lengths of time and note the effects.

3. Speed of cooking vs. temperature:

   Cook samples of either bread, cookies, or potatoes at varying temperatures. Cook all samples so that the outside of the food is cooked to the same degree: evenly browned, etc. Thus if the recipe calls for the food to be cooked at 300° for one hour, also try a small sample at 250° for a longer length of time, 200° for an even longer length of time, 500° for a very short length of time etc. Cut open the food and observe the depth of cooking.

4. Effect of uneven heat:

   Cover various portions of the food with a reflector (like aluminum foil). How long does it take the covered portion to cook? Does two layers of foil cut the heat transfer even farther? Three layers? Does it make a difference whether the foil covers top, bottom or sides?

5. Heat penetration:

   Place stainless steel cooking utensils such as forks, etc. into the food, (with part in and part sticking out) before the food is cooked. Does a baked potato cook faster around the fork? Vary the cooking times and depth of penetration of the utensil.

6. Internal temperature:

   If you have a cooking thermometer, measure the internal temperature of at least seven different baked foods. How does the internal temperature change during the cooking time? How does the internal temperature compare with the oven temperature?

7. Mixtures:

   If you have any favorite recipe vary the proportions of any of the ingrediants in at least seven different ways (adding extra of one ingrediant, or less of only one at a time).

THE JOB OF PALEONTOLOGIST

Studies the fossil remains of plants and animals.

Tries to trace the evolution of life.

Assembles fossils and tries to determine the age and characteristics of the plant or animal.

Makes detailed studies of the fossil layers of rock as an aid in finding petroleum.

Organizes expeditions to search for fossils.

Specific training for the job: three to six or more years of college.

Interests: working with physical objects; scientific and technical work; abstract and creative work.

Temperaments: likes variety in the job.
likes making judgments based on numerical data.
likes making judgments based on what he sees.
likes precise standards for the work he or she does.

Salary: $8,000 - $20,000.

TEACHING SUGGESTIONS FOR THE FOOTPRINT PUZZLE

Purpose: To acquaint students with the job of paleontologist.
To familiarize students with the kinds of information that can be discovered from some fossils.

Materials: Make transparancies or dittos of the footprint trails.

Procedure: Discuss what each of the footprint tracks show. Be open for differences of opinion and alternative hypotheses.

Possible answers:

1. Three bird-like animals meet at the same time. Only one walks away. The others are eaten or fly away.

2. A hopping animal with a dragging tail (like a pack rat) --going down a steep hill; trying to dodge a preditor.

3. A hooved animal going around an obstacle like a rock or a tree.

4. A sidewinder rattlesmake meeting and eating a kangaroo rat.

5. A fox-like animal investigating a circular object (maybe there is food in the tree).

6. Three bird-like animals (all of the same species) coming across the trail of a carnivore. Right hand bird is down wind. Middle bird probably came earlier and didn't have the scent there. Left hand trail was made after the scent was put down (note the investigative behavior).

7. A four-footed hooved animal (have some student demonstrate how a four footed animal walks--mark the prints or places where prints would be).

8. A four-footed large animal with a wide tail (brontosaurus) crossing a stream. A rabbit came and drank from the stream.

Other Procedures:

Make a game of the assignment by giving students clear acetate to make their own footprint puzzles. Prize to the best design.

Read the job description of the paleontologist.

Discuss what things you can learn from a fossil (see experiment in this series on an anthropological dig).

FOOTPRINT PUZZLE

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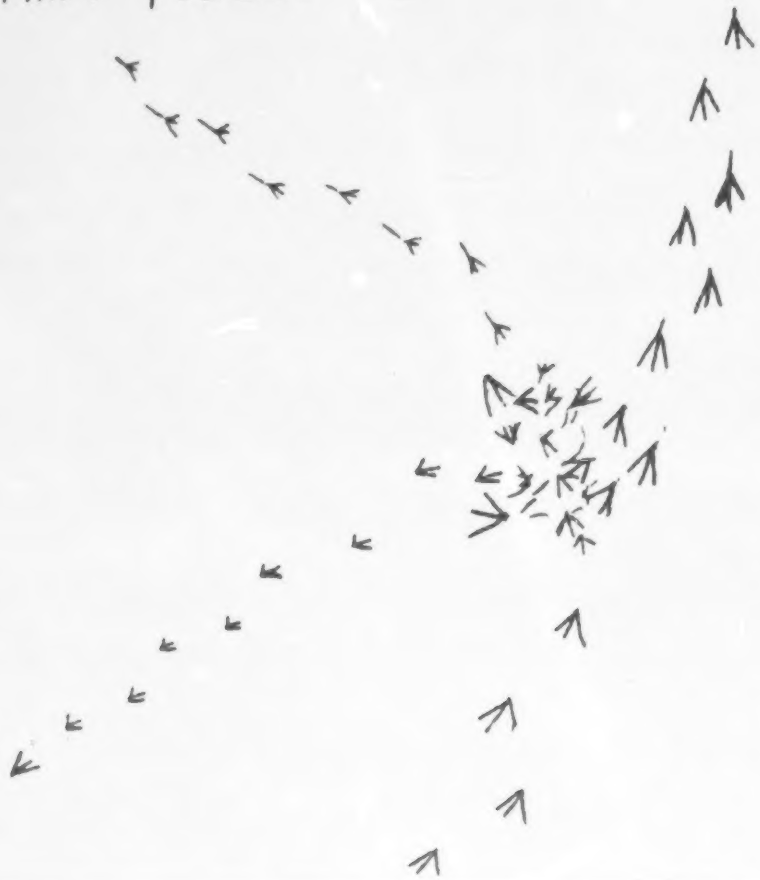

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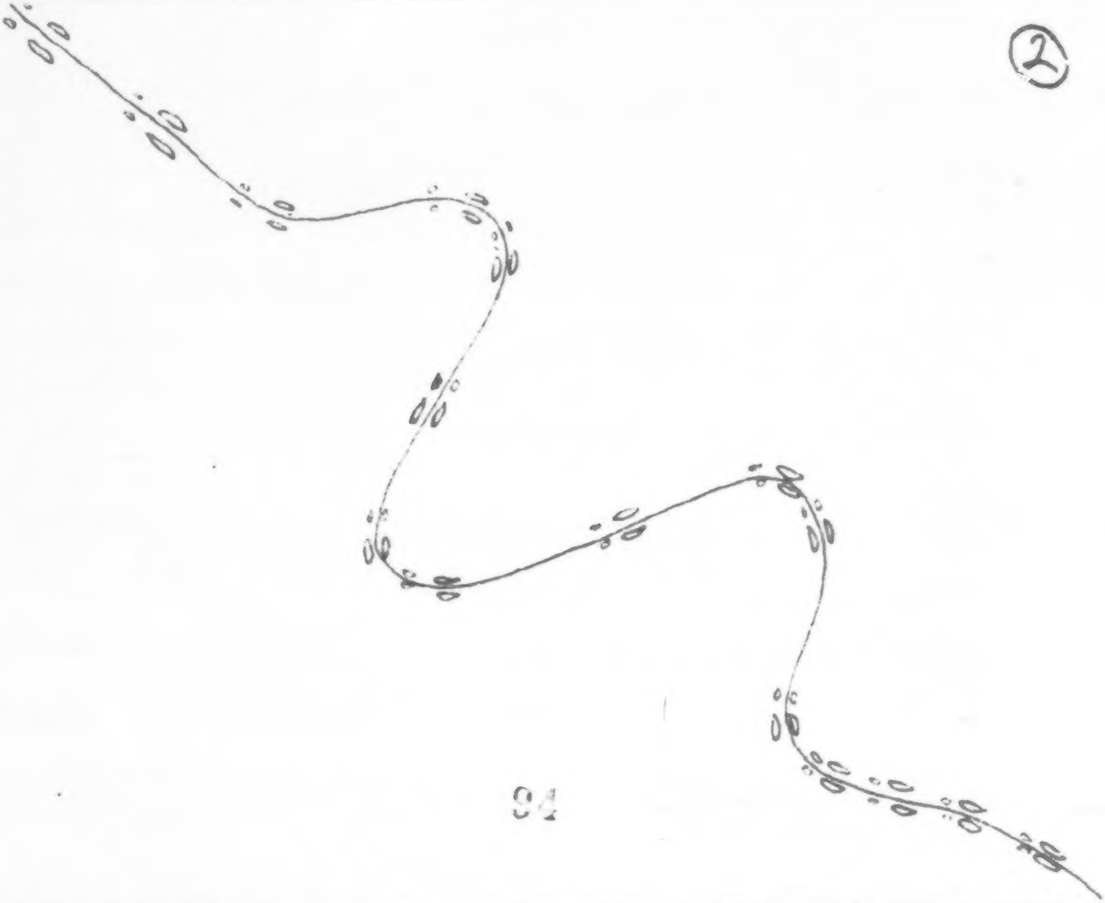

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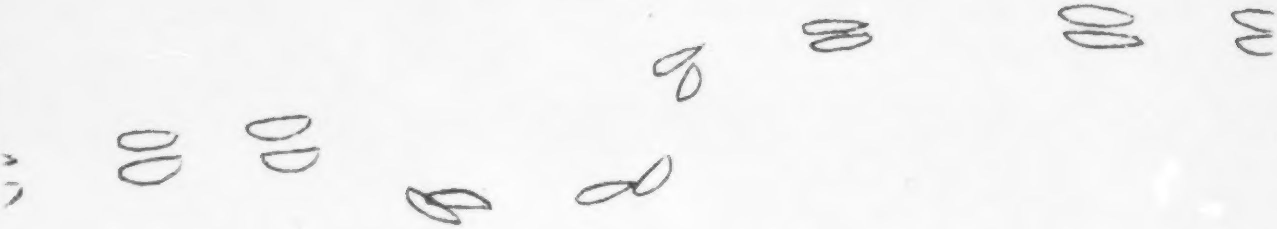
FOOTPRINT PUZZLE



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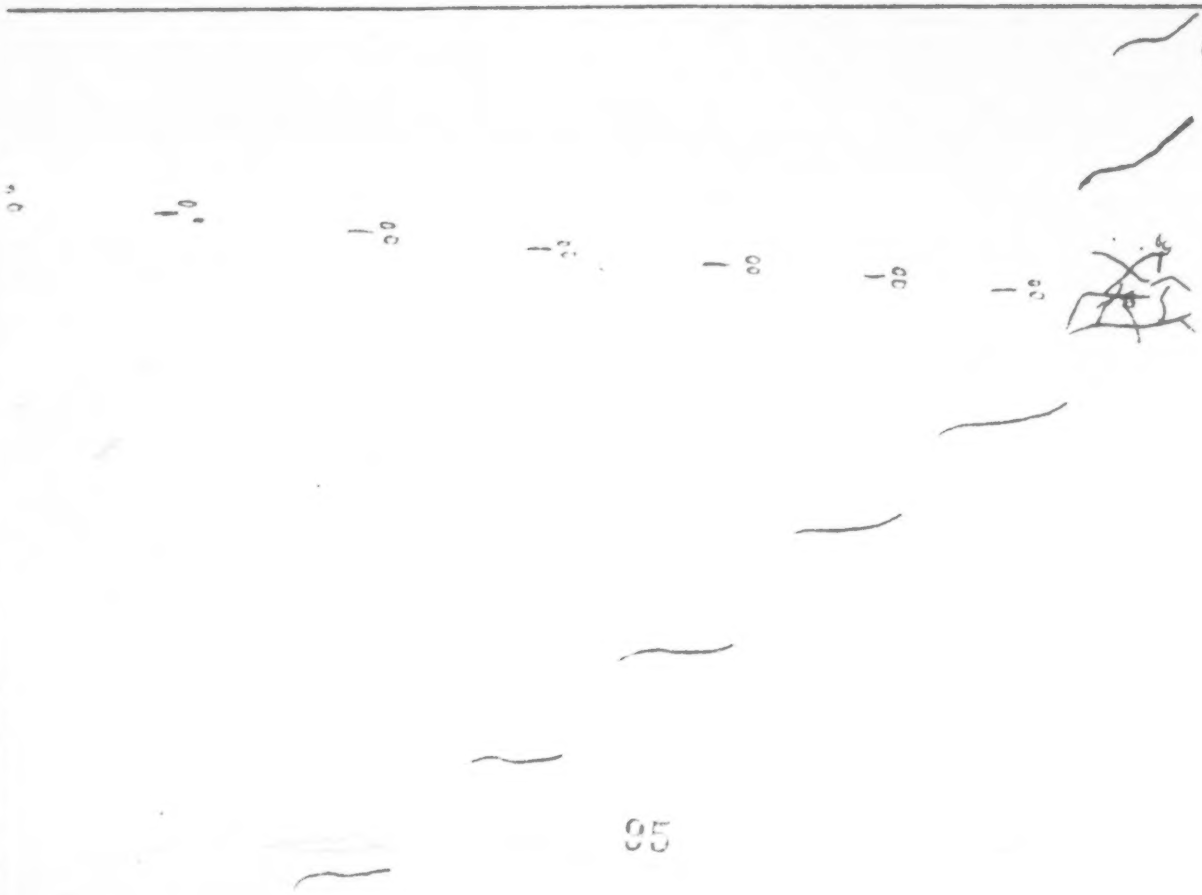

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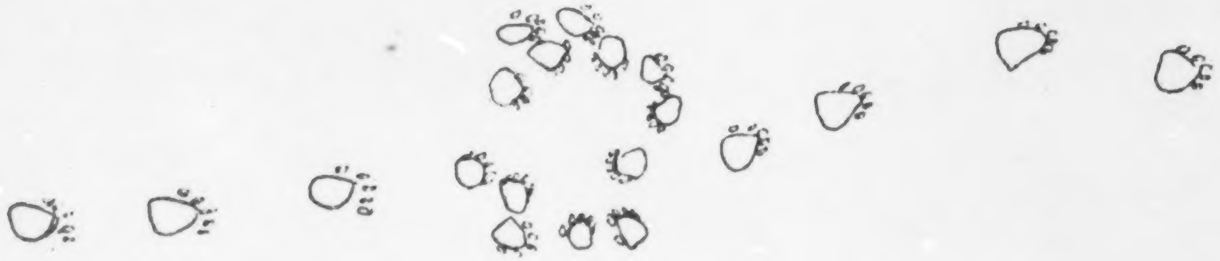
Foot Print Puzzle



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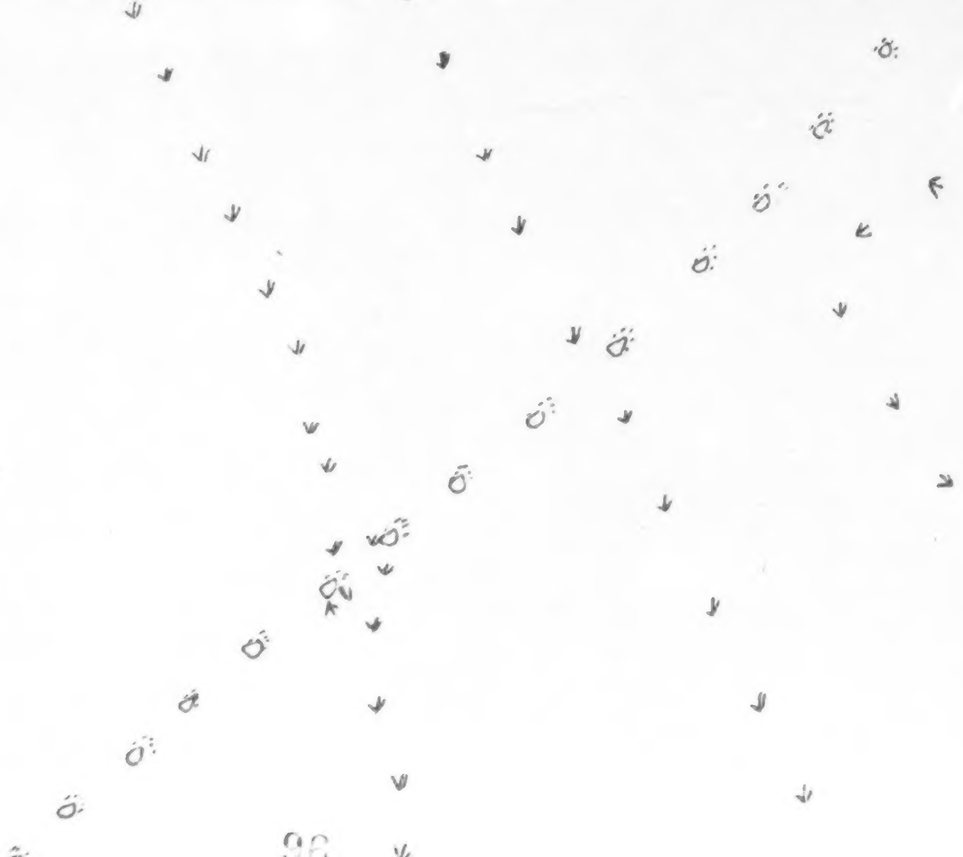

FOOTPRINT PUZZLE

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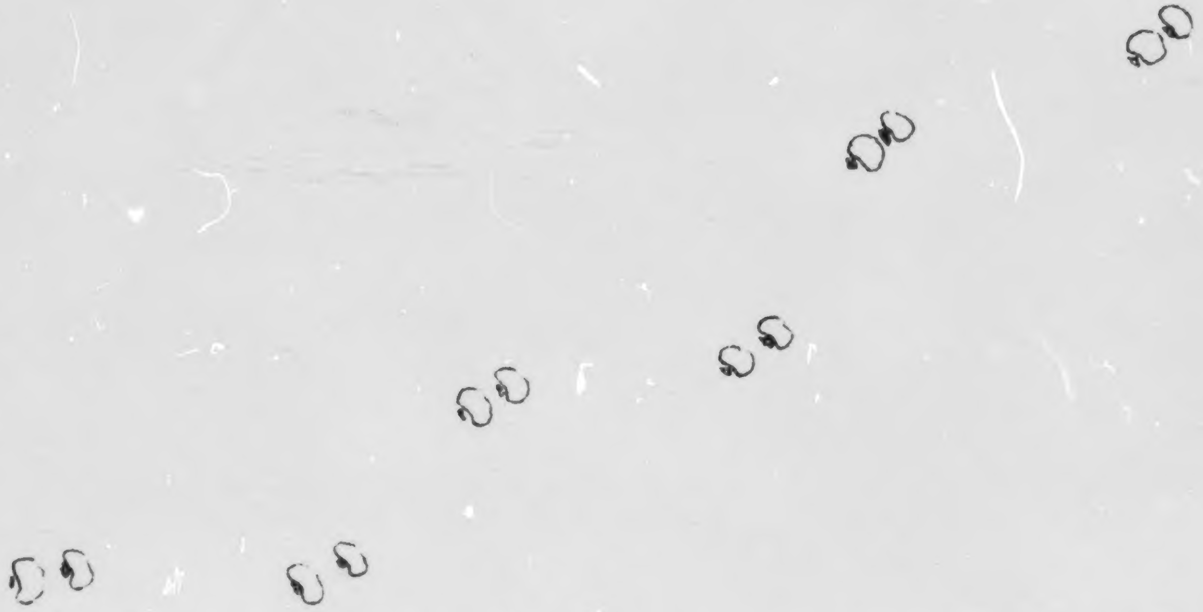

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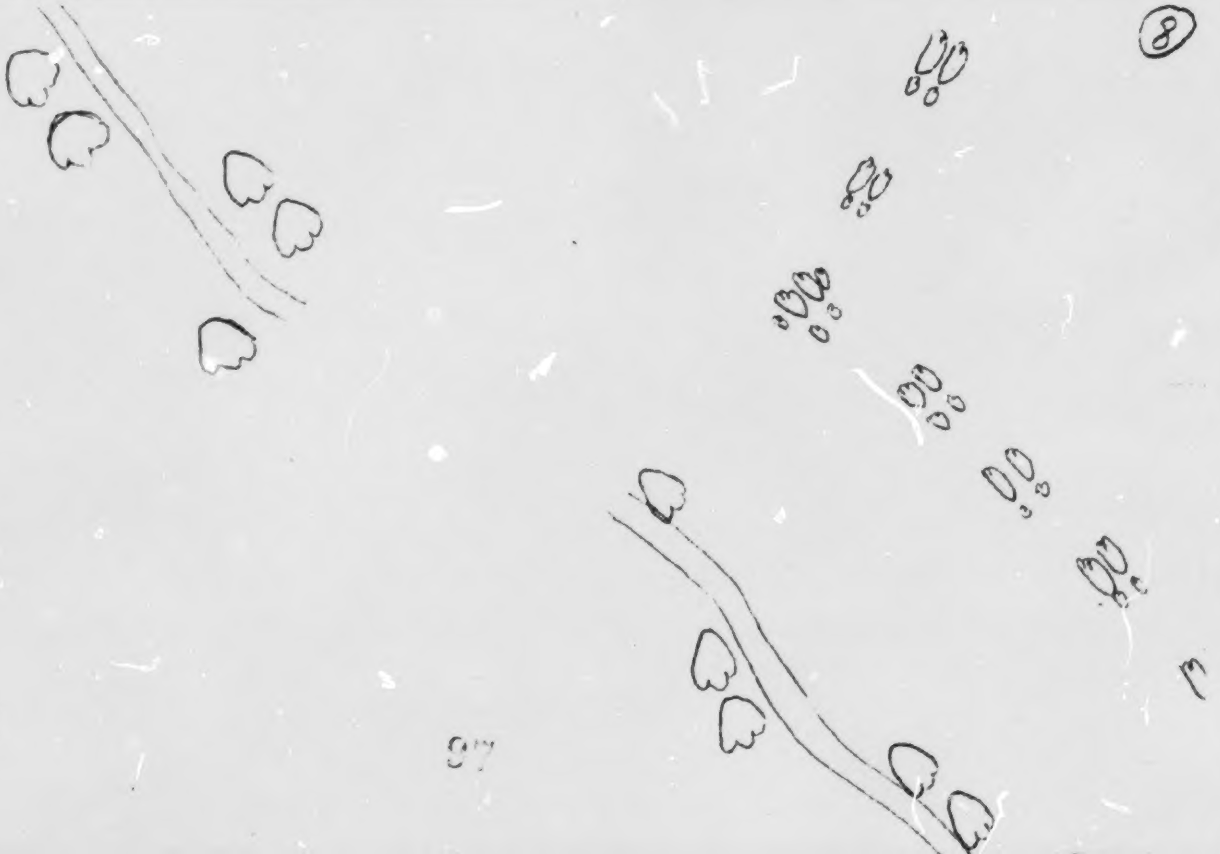


THE JOB OF MARINE ENGINEER

Designs equipment for use in ships, docks and marine facilities.

Designs powerplants for heating and lighting this equipment.

Designs engines that will run well in ocean conditions.

Oversees the installation of the equipment.

Studies the drawings and does the calculations necessary to enable the boats to hold up to the sea.

Directs inspection of marine facilities and boats, for which repairs or changes have been asked for.

Specific training for the job (on the job training and college courses): five to ten years.

Interests: pride in his work; communicating with people; scientific and technical.

Temperaments: likes change.
likes planning the whole job.
likes dealing with people.
likes making judgments based on what he sees.
likes making judgments based on numerical data.
likes precise standards for the work.

Salary: $12,000 - $20,000

TEACHING SUGGESTIONS
FOR DESIGNING AN UNDERWATER CITY

Purpose: To acquaint students with the job of marine engineer. To teach students the principles of bouyancy, pressure, corrosion, diving diseases, life support systems.

Materials: Students should get a lot of their own supplies but the following are necessities: a large tub or plastic garbage can in which to put the city, aquarium sealer, waterproof glue, and waterproof paints. Optional: a wave generator, rock salt, sand, plexiglass.

Procedures:

1. Give the students the assignment page.
2. Divide the class into teams with each team taking one section of construction.
3. Show them the tub which will contain the city
    a. It might make an interesting variation to have the shop cut a hole near the bottom of the tub (about six inches square) to act as a viewing hole. A piece of thin clear plexiglass should then be bolted to the inside of the hole. The holes should then be filled with epoxy cement or with aquarium sealer if they are not too big. Check if waterproof OUTSIDE.
    b. Sand can be added to the bottom to provide a base for the projects.
    c. A wave machine can be added at the top (or waves simulated with wooden boards moved by students) to provide some agitation of the water and test the projects for stability.
    d. Rock salt could be added to simulate the corrosive effects of sea water (35 g. per liter of water used)
    e. INSTEAD of the rock salt, guppies or other fish could be added to simulate sea life. (They should not be placed in water exposed to metals--especially copper and zinc (galvanized tubs).
4. Read the job description of the marine engineer.
5. Jacques Cousteau has written many books and articles about underwater living.

Procedures continued for DESIGNING AN UNDERWATER CITY.

6. Help the students plan the construction:
   a. Estimate the volume of the buildings.
   b. Figure out the weight of water displaced (1 ml. - 1 g).
   c. Make sure that the structure weighs at least this much.
7. Discuss diving diseases like the bends. How will the students structures solve these problems (in simulation).
8. Discuss the animals and plants that live in the sea. How will the students' structures provide means for capturing the holding these animals?
9. Discuss corrosion. How will the structures be protected?
10. Discuss food and oxygen requirements of man. How will these provisions be simulated?

DESIGNING AN UNDERWATER CITY

THE JOB OF A MARINE ENGINEER

1. Your assignment is to build a city that will actually go underwater. The following buildings and equipment should be divided up to be constructed by teams of three or four:

    Living quarters
    Power supply--nuclear and solar
    Communications and supply system with the surface
    Laboratory
    Mining and excavating rigs
    Fishing and greenhouse facilities
    Animal pens and living quarters
    Storage facilities and transportation

2. After you have decided on which part your team will construct, the next step is to go to the library and find at least one example of what already has been built. National Geographic Magazine is a good place to start looking.

3. Next make several detailed sketches showing what your buildings will look like both inside and out. The sketches should also show the functions of each piece of equipment.

4. Actual construction: Use as much immagination as possible. Your building will be built above water and then slowly submerged in a small basin of water. IT MUST BE LEAKPROOF. IT MUST NOT FALL APART IN WATER. IT MUST BE WEIGHTED SO THAT IT WILL SINK GENTLY TO THE BOTTOM. Plastic outside parts, a good waterproof glue, aquarium sealer, and waterproof paints are suggested. The water will contain salt so metal parts must be protected. The surface of the water will be wavy so any light piece of equipment must be well anchored.

5. Good Luck!

THE JOB OF PHYSICIST

Studies the physical universe: matter and energy.

Studies hearing and sound: may design loudspeakers and improve the accoustics in auditoriums.

Studies the structure of atoms and molecules: may help design nuclear power plants and equipment for radioisotopes.

Studies electricity and magnetism: conducts experiments to improve power lines, transformers, etc.

Studies crystals: may be involved in improving the transistor.

Studies light and its applications, like lasers and photography.

Studies heat: how to keep engines from burning up, how to improve heat generation, how to use the heat pump.

Specific training for the job: four to ten years of college.

Interests: scientific and technical work, abstract and creative work.

Temperaments: likes planning the whole job.
likes making judgments based on numerical data.
likes making judgments based on what he sees.

Salary: $10,000 - $20,000

MEASURING ATHLETES FOR POWER AND SPEED

THE JOB OF A PHYSICIST

1. Measure out four 100 foot sections around a track or around a large field. The first section will be at the start where the runners begin. The second section will be immediately following the first. The third and fourth sections may be anywhere else on the track.

2. Four students will be sent to each section: three to time how long it takes for a runner to travel through their 100 ft. section, and the fourth to take an average of the three timers and to record data. Use watches, stopwatches, metronones, or even counting (1001, 1002, etc.) to record the time.

3. Speed = distance (100 ft.) divided by the average time.

4. To find the acceleration of the runner:

    a. Subtract the speed for the first 100 ft. section from the speed for the second 100 ft. section.

    b. Add the average time for the first section to the average time time for the second.

    c. Divide the answer from "b" by two.

    d. Divide the answer from "c" into the answer from "a".

INSIDE ACTIVITIES

5. Squeeze a bathroom scale holding it in both hands with the thumbs on top and the fingers on the bottom to find the maximum force that a person can exert with his hands.

6. Horsepower output of a person: lifting weights

    a. Adjust the weights so that the person can comfortably lift them without strain. Protect the floor from falling weights.

    b. At the signal the person being tested is to lift the weights to chest level and put them back down. He is to pick them up and put them down as fast as he can for a period of one minute.

    c. The amount of horsepower the person can exert is the weight he lifted (in pounds) times the height he lifted them (in feet) times the number of times he lifted divided by 33,000.

    $$\text{HP} = \frac{\text{weight X distance X number of times}}{33{,}000}$$

    d. Compare your horsepower to that of your family car.

7. Repeat part six lifting small weights only a distance of one foot with your biceps muscles. (Try for as many lifts as possible in one minute.)

8. Repeat part six lifting a small weight a distance of 1/2 foot with your legs. Lie down on the floor and have someone place a small amount of weight on your ankles (the weights will not slip if they are tied lightly with cloth). Again try for the maximum lifts in one minute.

9. Read the job summary of a physicist.

MEASURING SPEED + ACCELERATION (THE JOB OF A PHYSICIST)

	SECTION 1					SECTION 2					SECTION 3					SECTION 4					
STUDENT	TIME	TIME	TIME	AVG	SPEED	TIME	TIME	TIME	AVG	SPEED	TIME	TIME	TIME	AVG	SPEED	TIME	TIME	TIME	AVG	SPEED	ACCELERATION

MEASURING FORCE + POWER

						BICEPS LIFTING				LEG LIFTS			
STUDENT	SQUEEZING FORCE	WEIGHT LIFTED (POUNDS)	DISTANCE LIFTED (FEET)	# OF TIMES LIFTED	HP	WEIGHT	DISTANCE	# OF TIMES	HP	WEIGHT	DISTANCE	# OF TIMES	HP

POOL HALL PHYSICS

THE JOB OF A PHYSICIST

Make at least one sketch (preferably two) for each activity below. Show the results. Try to draw some conclusions which will improve your pool shooting. NO GAMES. Be careful with the equipment.

1. Angle of incidence and reflection:
   Bounce a cue ball off a cushion at different angles.

   Bounce it hard, medium and soft. Is energy lost?

2. Collision:
   Hit a cue ball hard against one other ball straight on.

   Against two balls in a line, three, four, five.

3. Angle shots:
   Place the ball and the cue ball in such a way that the ball must be glanced by the cue ball to go into the pocket. Shoot carefully at least ten trials. What is the maximum angle you can make the ball go off at?

4. Momentum:
   Use a soft touch on the cue ball, a hard touch.

   Hit the cue ball high, hit it straight on, hit it low (carefully or you will pay for the pool table).

5. Bank shots--imagine the cushion as a mirror and the hole as a reflection.

6. Combination shots: Try to do some planning—record results.

20 PUZZLES FOR USE IN CLASSROOM

TEACHING SUGGESTIONS FOR PUZZLES

Purpose: To acquaint students with career names and job descriptions.
To facilitate development of research and clerical skills.

Procedures: The idea behind the crosspatch type puzzle is to use the word list provided to fill in the pattern of squares. The word finds can be made more difficult by not providing the students with the word list they are to be looking for. Words run horizontally, vertically, backwards, forwards, and even diagonally.

Additional activities may be used along with the puzzles:

1. Students are to look up one job that interests them and find out as much information about it.
2. Students may try to bring in a speaker to talk about any particular job.
3. Students checkmark which jobs might interest them and then checkmark which jobs they will be able to do with the education they plan to get.
4. Values clarification continuum--draw a chalk line down the center of the classroom; mark one side "strongly agree" and the other side "strongly disagree". Place a chair at the middle position. Students are to stand on that line according to their position on some controversial topic: eg. The federal govrn't should subsidize all environmental jobs because they are so important; Jobs in the sciences are fun; Jobs in the space field are unnecessary, etc. Keep the students off the middle chair to encourage some degree of commitment.
5. Do a one-week survey of the help wanted sections to find out which, if any, of the jobs are in demand (the New York Times has a much better selection than local papers)
6. Find out which of these jobs are familiar to the students' parents.
7. Values clarification commitment: develop a specific plan of action for one job in the area of study; identify years of schooling, types of courses needed, summer jobs for practical experience, how much money needed for training, expected rewards.
8. Write a job resume for one of the jobs being studies: "summarize the experience and background you will expect to have when you finish your schooling. Sell your qualifications to your future employer."

GENERAL SCIENCE CAREERS CROSSWORD PUZZLE

Across

1. Designs radios and TV's
3. Protects woodlands
6. Sets up and operates radio and TV broadcast equipment
13. Studies insects
17. Studies light, heat, sound, motion, etc.
19. Repairs teeth
20. Studies plants and flowers
23. Grows trees and shrubs
24. Finds and extracts minerals from the earth
25. Joins pieces of metal together
26. Studies rocks
28. Studies reptiles
29. Studies how the human body is put together
30. Tries to recover underwater objects
31. Repairs wiring

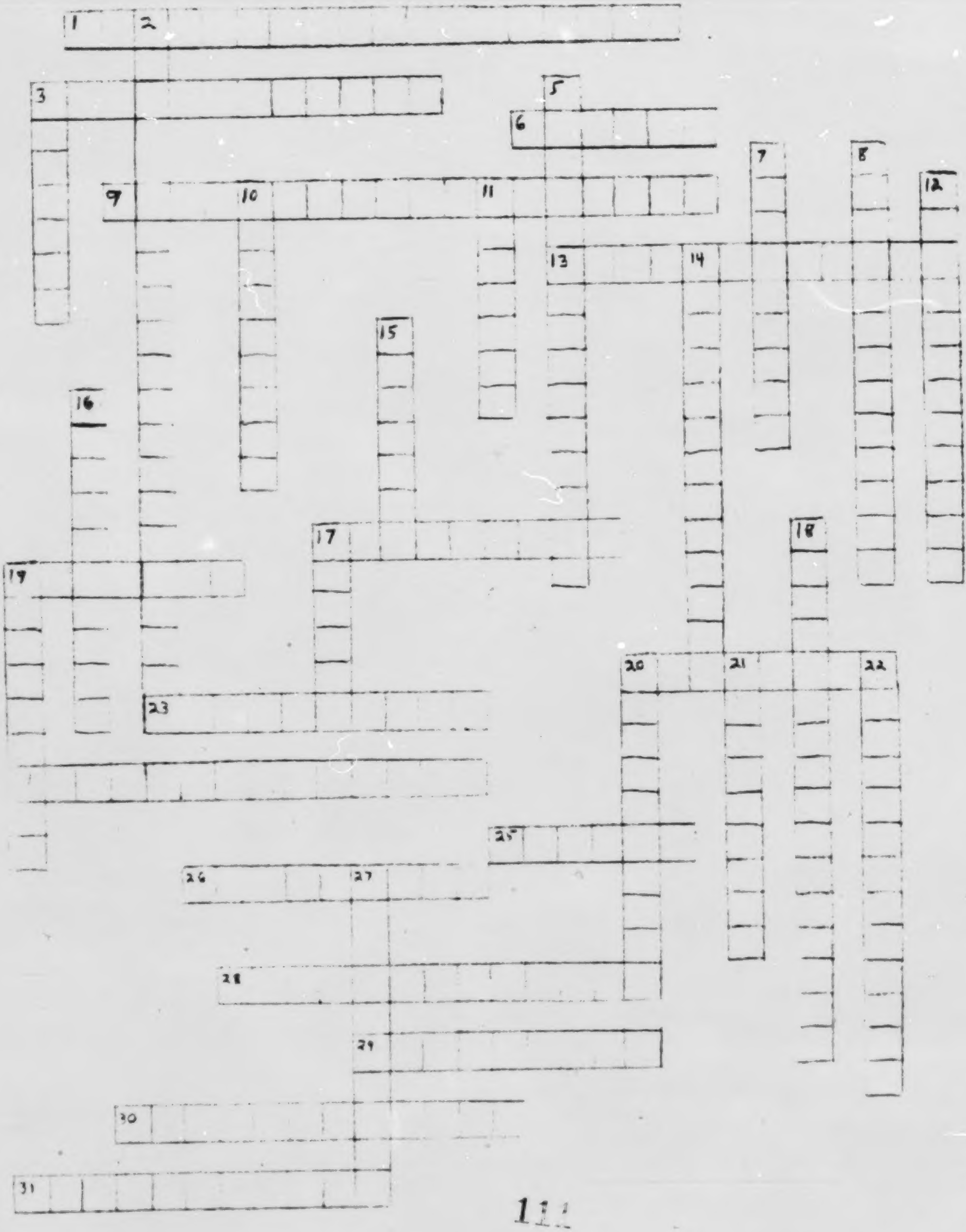
Down

2. Tests and repairs radios, TV's, etc.
3. Puts out fires.
5. Studies underwater plants and animals
7. Studies animals
8. Designs highways and bridges
10. Specialist in planning meals
11. Studies chemicals
12. Tries to cure diseases in animals
14. Studies the weather
15. Male hospital attendant
16. Studies stars and space
17. Creates items from clay
18. Designs equipment for the manufacture of chemicals
19. Draws exact plans for use in manufacturing
20. Studies chemicals in the body
21. Draws exact building plans
22. Captures fish by setting out traps
27. Prevents violations of laws against wildlife

BY______________DATE_________ SUBJECT______________________________________ SHEET NO.________OF___

CHKD. BY_______DATE________ ____ JOB NO _______________

GENERAL SCIENCE CAREERS
CROSSWORD PUZZLE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BY.............. DATE.......... SUBJECT.. SHEET NO.......... OF..

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GENERAL SCIENCE CAREERS
CROSSWORD PUZZLE - ANSWER

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    E L E C T R I C A L E N G I N E E R
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  F O R E S T R A N G E R       M
  I     C                     F A R M E R
  R     T                       R           Z     C
  E   B R O A D C A S T T E C N I C I A N   O     I   V
  M     O     I             H   N           O     V   E
  A     N     E             E   E N T O M O L O G I S T
  N     I     T             M   B       E   O     L   E
        C     I       O     I   I       T   G     E   R
        S     C       R     S   O       E   I     N   I
    A   T     I       D     T   L       O   S     G   N
    S   E     A       E         O       R   T     I   A
    T   C     N       R         G       O         N   R
    R   H             L         I       L         E   I
    O   N         P H Y S I C I S T     O     C   E   A
D E N T I S T     O             T       G     H   R   N
R   O   C         T                     I     E
A   M   I         T                     S     M
F   E   A         E                 B O T A N I S T
T   R   N U R S E R Y M A N         I     R   C   R
S                                   O     C   A   A
M I N I N G E N G I N E E R         C     H   L   P
A                                   H     I   E   F
N                           W E L D E R   T   N   I
          G E O L O G I S T         M     E   G   S
                    A               I     C   I   H
                    M               S     T   N   E
            H E R P E T O L O G I S T         E   R
                    W                         E   M
                    A N A T O M I S T         R   A
                    R                             N
      S A L V A G E D I V E R
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BY________ DATE________ SUBJECT________________ SHEET NO.____ OF____

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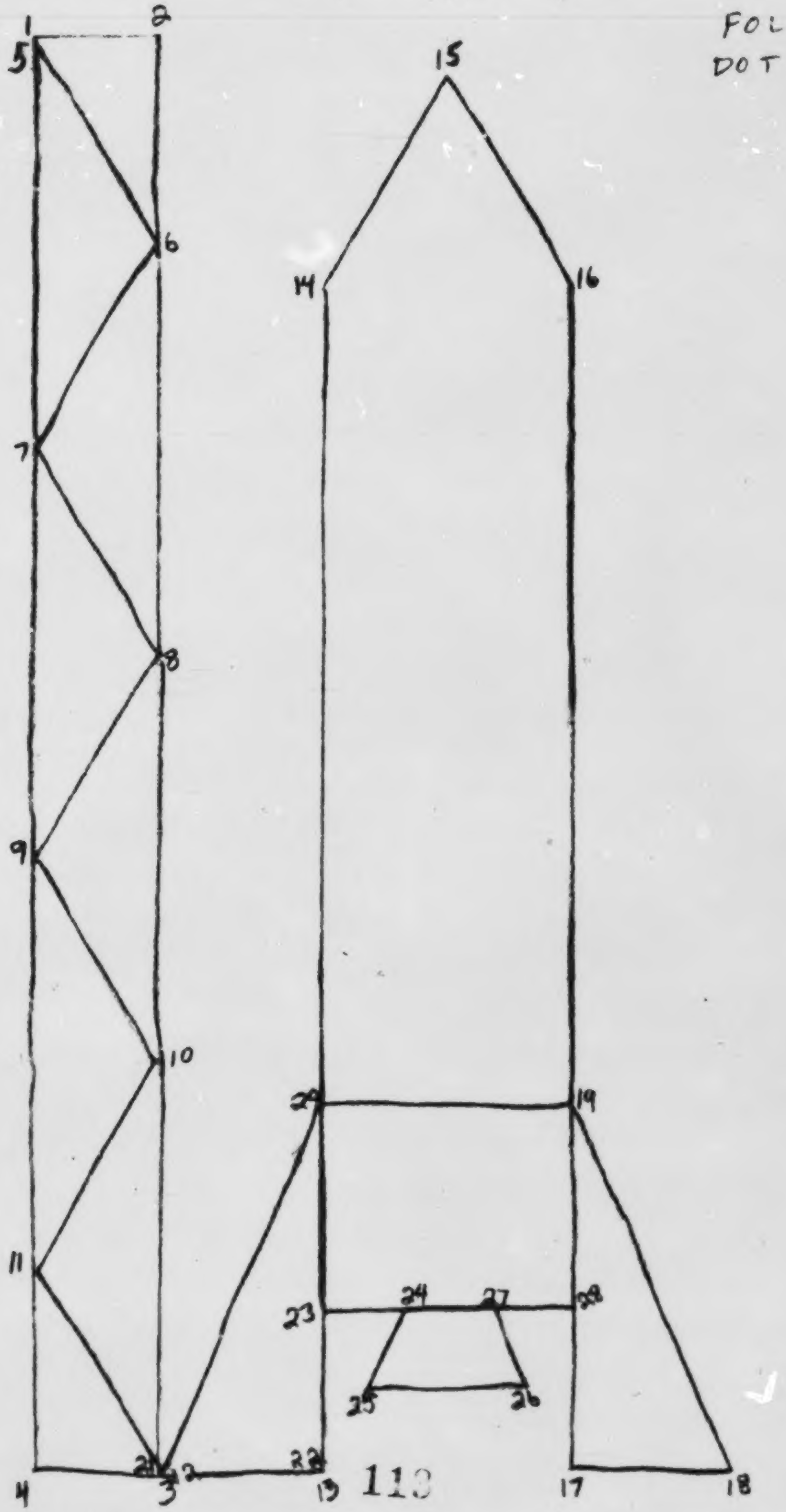
FOLLOW THE DOT - ANSWER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BY______________DATE_________ SUBJECT____ SHEET NO._________OF____

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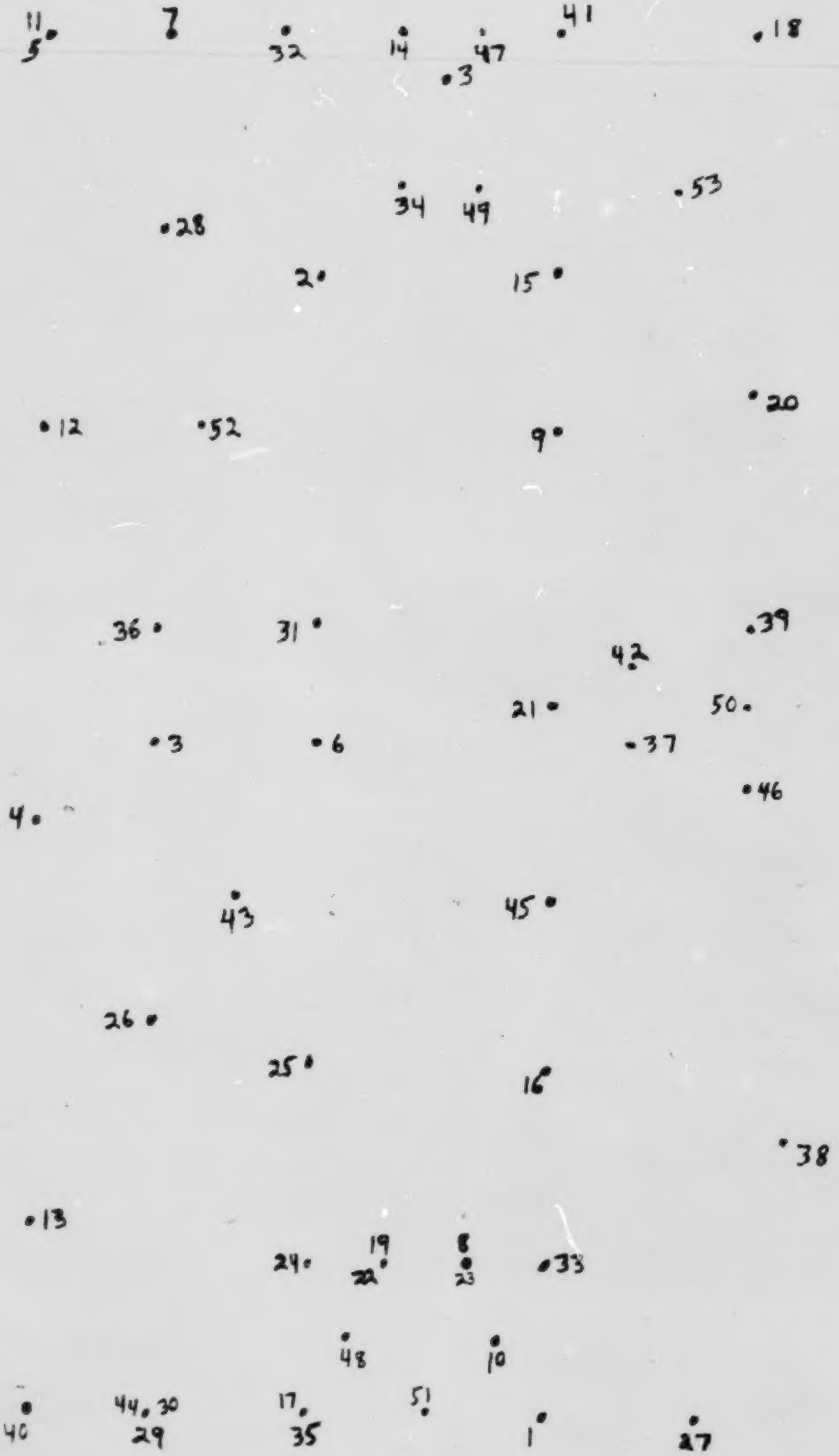
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CAREERS IN SCIENCE

Astronomer -- studies the stars and space
Bacteriologist -- studies microbes
Botanist -- Studies plants
Biochemist -- studies chemicals in the body
Chemist -- studies chemicals
Dentist -- repairs teeth
Dietitian -- specialist in planning meals
Electrician -- repairs wiring
Fireman -- puts out fires
Geologist -- studies rocks
Inhalation therapist -- operates oxygen equipment for hospital patients
Physician -- treats diseases of the human body
Psychiatrist -- tries to cure mental disease
Forest ranger -- protects woodlands
Orderly -- male hospital attendant
Veterinarian -- tries to cure animal diseases
Zoologist -- studies animals
Nurseryman -- grows trees and shrubs
Physicist -- studies light, heat, sound, motion, etc.
Photographer -- takes pictures
Meteorologist -- studies the weather
Farmer -- raises crops and animals
Game warden -- prevents violations of laws against wildlife
Mining engineer -- finds and extracts minerals from the earth
Marine biologist -- studies underwater plants and animals
Salvage diver -- tries to recover underwater objects
Trap fisherman -- captures fish by setting
Broadcast technician -- sets up and operates radio and TV broadcast equipment
Potter -- creates items from clay
Chemical engineer -- designs equipment for the manufacture of chemicals
Electrical engineer -- designs radios and televisions
Civil engineer -- designs highways and bridges
Entomologist -- studies insects
Herpetologist -- studies reptiles
Anatomist -- studies how the human body is put together
Electronics technician -- tests and repairs radios, televisions, etc.
Draftsman -- draws exact plans for use in manufacturing
Architect -- draws exact building plans
Welder -- joins pieces of metal together

FOLLOW THE DOTS

Next to the name of the scientist, place the number that corresponds to the object that the scientist studies or works on. If the numbers are then followed in the sequence you have listed them (ie. start with the number that you placed after "astronomer"; draw a line connecting that number to the number you have placed after "bacteriologist", etc.) a picture will be traced out. It is very important to note that the numbers will NOT be followed in numerical order and many numbers will not be used in tracing out the picture.

A: astronomer
B: bacteriologist
C: botonist
D: chemist
E: dentist
F: electrician
G: geologist
H: zoologist
I: meteorologist
J: oceanographer
K: herpetologist
L: anatomist
M: physiologist
N: entomologist
O: psychiatrist
P: psychologist
O: pharmacist
R: ecclogist
S: pathologist
T: apiculturist
U: geneticist
V: biologist
W: sericulturist
X: virologist
Y: vulcanologist
Z: physican
AA: ichthyologist
BB: hydrologist
CC: seismologist
DD: ornithologist

earthquakes - 22
volcanoes - 48
silkworms - 24
breeding - 30
disease and death - 16
drugs - 1
mental disease - 3
body chemistry - 35
reptiles - 13
weather - 4
rocks - 12
teeth - 5
plants - 29
stars - 11
treats illness - 10
birds - 23
water - 33
viruses - 19
life - 17
bees - 25
balance in nature - 27
human behavior - 15
insects - 2
body structure - 44
ocean - 26
animals - 36
wiring - 28
chemicals - 40
microbes - 7
fish - 8

CAREERS IN ENVIRONMENTAL SCIENCE (50 NAMES)

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A L C S C A D R E N T O M O L O G I S T J A V R K T H O N U
G K A E J O U B X M S R B C A S E S A U D I O L O G I S T O
A O M F P U T L T C I O T E B X O I N M V R N K P T G O P S
M K P J I A R D E M G T N A M H G L I W P A P O U R H R S U
E R G G E T A N R T O I C N U O R W T D A N O M L S C E T R
M E R I V I F O M D L N P O A T A N A I T A N R N T L E S V
A E O R O C F N I V O O G G R O P A T A H L E S O M I N I E
N N U E H B I W N F I M D R E U H I I R O Y D L R P M I L Y
A I N N T I C H A H B N P A E R E C O E L S R O M O B G A O
G G D N S O E I T X O O G P N U R I N T O T A R   R E N R R
E N C A I L N T O J R I M H I N L T E S G P W E K E R E U L
M E A L G O G S R O C T F E G A N S N E I O E T O G N G T J
E Y R P O G I I U L I A K R N U B I G R S E R S J N K N A M
N R E N L I N N K R M I P V E O X T I O T C I E E A L I N R
T A T A O S E A G O D D W F L A W A N F B A F R I R I N K E
A T A B C T E T V S O A E V I B C T E C W H V O G K F I R E
G I K R E K R O W L O R T N O C T S E P A R K F O R E M A N
E N E U O W I B M D F L U E S K V D R J I W T S H A R H P I
N A R X H R C N J T A U T S I G O L O C E T N A L P K J O G
T S I G O L O R O E T E M T S I G O L O I B Y R E H S I F N
W A G B S P X T V W O R N I T H O L O G I S T X G W I G F E
T S I G O L O H T A P T N A L P G D I F X U I F A J B D U C
E A S A N I T A R I A N F C E K H E J D E U G A V H C P M I
B E C O T S I T N E I C S L I O S K G I J H V R W B S F I L
A T S I G O L O C E L A M I N A W A T E R T E N D E R T G A
S A N I T A R Y I N S P E C T O R F M L K H A G B F O E A R
D T D B T U O K O O L E R I F L H E R P E T O L O G I S T D
C R O S I V R E P U S Y R O T A R O B A L D C E F M O E O Y
S E R U R E G A N A M E G N A R E P E E K E M A G P O M R H
B F O R E S T E N G I N E E R E H P A R G O R D Y H N D N C
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CAREERS IN ENVIRONMENTAL SCIENCES

Air Analyst
Audiologist
Water Purification Chemist
Garbage Collection Foreman
Industrial Waste Inspector
Laboratory Supervisor
Radiation Monitor
Sanitary Inspector
Septic Tank Serviceman
Sewage Disposal Worker
Sewage Plant Attendant
Sewage Plant Operator
Sanitation Engineer
Water Tender
Entomologist
Exterminator
Field Health Officer
Food and Drug Inspector
Food Service Supervisor
Fumigator
Pest Control Worker
Industrial Health Engineer
Industrial Hygienist
Food Microbiologist
Milk Sampler
Plant Pathologist
Plant Quarantine Inspector
Public Health Bacteriologist
Sanitarian
Sanitary Inspector
Camp Ground Caretaker
Construction Engineer
Geographer
Landscape Architect
Land Use Technician
Sanitary Engineer
Statistician
Traffic Engineer
Urban Planner
Weed Control Supervisor
Aquatic Biologist
Ecologist
Soil Engineer
Fire Lookout
Fire Patrolman
Fire Warden
Forester
High Climber
Forester Aide
Forest Ecologist
Forest Engineer
Forest Fire Fighter
Gamekeeper
Hydraulic Engineer
Surveyor
Mining Engineer
Park Foreman
Park Naturalist
Park Ranger
Park Superintendent
Plant Ecologist
Range Manager
Soil Scientist
Fishery Biologist
Game Management Agent
Wildlife Biologist
Animal Ecologist
Botanist
Hydrographer
Meteorologist
Oceanographer
Pathologist
Herpetologist
Ornithologist

JARGON OF AN AUTO MECHANIC (50 WORDS)

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O W E X O R A W R R S C Y E N I L E K A R B L N K O J E I V
P I N M A N I F O L D G W C D O R E I T A C H O M E T E R L
S N G R E P S T B S U N D A M X D R S C B C N I J H K O F D
E D I A L R N O V U V I N D Y O F U A M O O S E R I T G W R
C S N R E T G R O T N R E M I I A R Z N I P G I R U U E E O
O H E E C O A E F U R I U D L H B L T S H W R F B L L B K T
N I V L T N S T N P O W V T X U S R S Q I E G I P L R R A O
D E L D R I K R O C H K E E R R O I K E D J R K M O Q E R R
A L A I I A E A T T Y R P E R L M N Y N X T R E S H G A B E
R D V L C R T T S J Z B T S A S A C I D S A T B F P I K A S
Y A G I A T I S I O P O R R N T A L D I P E A H G F J E L N
R S U O L R Z E P A R T M A S B Y L D S R K I E K O L R L E
E H H I S E V A N U I A R A K C J C J H C H A S S I S M I D
T B V D Y W Z L W M M T G E N E R A T O R E T L I F N A O N
T O G A S O L I N E A B X R E D A E H P I O G X K E Z B I O
A A X R T P Y A Y L R K   K J Q I S T H U N W N N Y C O N C
B R A K E S H O E S Y Z R E D N I L Y C R E T S A M D E T F
W D J U M P E R W I R E S L R A G S M F V B E D L C M C B D
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JARGON OF THE AUTO MECHANIC

Ball Joint
Idler Arm
Tie Rod
Control Arm
Shock Absorber
Carburetor
Gasket
Engine
Starter
Tires
Oil
Gasoline
Gas Tank
Header
Exhaust
Valve
Cylinder
Generator
Universal Joint
Transmission
Filter
Seal
Spark Plug
Breaker
Wiring

Rotor
Chassis
Dwell Meter
Tachometer
Diode
Manifold
Emergency Brake
Windshield
Piston
Condenser
Distributor
Air Filter
Brake
Brake Line
Master Cylinder
Brake Shoes
Electrical System
Power Train
Battery
Jumper Wires
Primary
Secondary
Horn
Radio
Dashboard

CAREERS IN CHEMISTRY (30 WORDS)

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A H R G I R F S U H V E W V A B W L C X T V J D U I E S F G
T N W L Q K P J P T V O X N G W M X K K S O I H H R G F P F
K P A D H E S I V E S C H E M I S T Y N I Z Y X T G F E R R
S J T L M Q O M I Y D L R E T S E T R E M Y L O P D O H E E
L N E E Y N Z T S I M E H C S T N E G R E T E D Q I O T S W
A I R A T T R U B B E R C H E M I S T W H B A J C J D N E O
B O P T S M I P L H M R E K A M R O L O C S P K U P C A R L
O L U H I K N C P E R F U M E R V N Z M L I L B O U H I V B
R J R E M A O L A G U T R C U S B O S Y A T C N V L E C E S
A K I R E O R M I L G B B M C A P R Y Q E M N M M A M I D S
T T F C H Q G P N A C E T D L Q C Z H R R D B E L K I N F A
O S I H C T A B T S F H A R S Z A O X Y E Z O A V C S H O L
R I C E N S N N C S C P E T R O L E U M C H E M I S T C O G
Y M A M O I I O H C J Z D M K G X W G N F P L D W J K E D E
S E T I I G C O E H Q I A H I W G R Q F S E U I V W J T S T
U H I S T R C N M E F E Y B E S U G A R C H E M I S T Y C S
P C O T A U H P I M D T C U V V T X H K T J H X K P I R H I
E S N K T L E G S I F R U S T S I M E H C C I N A G R O E M
R C C R N L M Q T S O C U N J D W I Y A G Z Y B Q H L T M E
V I H H E A I E P T S I M E H C N O I T C E F N O C G A I H
I T E J M T S T V S I C L U M V T F A Z B R C D M E B R S C
S S M Q R E T S I M E H C L A R U T L U C I R G A D F O T D
O A I X E M H T B R F K Q J E I P H S D O G N C F E A B D O
R L S I F S A W G T S I M E H C S T C U D O R P V R I A D O
A P T E X T I L E C H E M I S T S I M E H C E Y D B C L C W
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CAREERS IN CHEMISTRY

Analytical chemist
Inorganic chemist
Glass chemist
Glass blower
Organic chemist
Adhesives chemist
Detergents chemist
Paint chemist
Petroleum chemist
Plastics chemist
Rubber chemist
Wood chemist
Agricultural chemist
Dye chemist
Color maker
Food chemist
Cereal chemist
Confection chemist
Dairy products chemist
Fermentation chemist
Preserved foods chemist
Sugar chemist
Leather chemist
Textile chemist
Laboratory supervisor
Perfumer
Laboratory technician
Water purification chemist
Polymer tester
Metallurgist

TOOLS OF A PHOTOGRAPHER (50 WORDS)

A V O I Q W T C M Y D K Z K A D O K O D A C H R O M E K O H
P J W M B N P X Q L R W A E A R E M A C N T R E P O B O P M
H N U X O R S Y A Z P O T S F A D E I N S E U B A J A L A O
S N E L D N U O P M O C F E V F M K O L T F C M C N C P R C
A R B S B T F P E N T A P R I S M I R T R I G U S I K N E I
L E M U L S I O N D X M D B L J T E U M D E H N N H L G M T
F P A V U Z L C Y G C E G C H A T H B E A T I A E O I R A A
C O T H A F M E A D K R I B T L S D S N Q H R S L F G M C M
I L T G E P A C S D N A L I I E S F C N H G E A R A H T E O
N E E H T S A R T N O C G F F S T R O B E I O K E G T R I R
O V I X F O C U S F L A S H B U L B G D P L L F X S I I V H
R E D N I F E G N A R S Y N C H R O N I Z E D J I B N P O C
T D Y N J I E C N A L E E R F G D E R A R F N I F T G O M N
C Z A   Z W J V P O R T R A I T E L O I V A R T L U E D O A
E P H O T O G R A P H Y U T H B L H C X I S W V D C U Y D P
L M O O R K R A D R Y E R K N I T A L E G N I G R A L N E A
E M O R H C A T K E X P O S U R E V I T A G E N I A R G L Z

PHOTOGRAPHIC JARGON

Photography
Camera
Lens
Exposure
Negative
Shutter
F-Stop
Developer
Fixer
Portrait
Matte
Rangefinder
Compound Lens
Zoom
Kodachrome
Model
Lens Cap
Infrared
Ultraviolet
Darkroom
Enlarging
Free Lance
Kodak
Landscape
Agitation
Contrast

Emulsion
Movie Camera
Back Lighting
Flashbulb
Pan
Ektachrome
Pentaprism
Camera Case
Antihelation
Filter
Gelatin
Synchronized
Strobe
Focus
Grain
Dryer
Darkroom
Safelight
Tripod
ASA Number
Fade In
Film
Panchromatic
Electronic Flash

JARGON OF THE METEOROLOGIST (50 WORDS)

S D N E M C T N O R F D L O C C L U D E D F R O N T S F Q P
O L H B L T N I O P W E D O L D R U M S U T A R T S R Q P S
G E I L E N O L C Y C A H D G K M R E H T O S I S O B A R U
F Z G N I K P A C O N V E C T I O N U G O R E T E M O R A B
Y G H L G A I J I R V I J H R N O I T A R O P A V E R E D M
K N P M H P H X O W O F C F T S N L A E N A C I R R U H I I
O T R J E R S T R A T O S P H E R E L I V E D T S U D O A N
E N E U R E D Y T D R Y B U L B J O U M A E R T S T E J T O
R O S P U C N S C L I M A T E P E R E H P S O M T A K L I L
U R S A S I I S U H E G O F T C E F F E S I L O I R O C O U
S F U M S P W A M C R B W R V T A U I T P N S N M E D I N M
S R R R E I E M U W D O A B E A S T E R L I E S O P N R O U
E A E E R T D R L B N I M E Z U T X S T S A H P G M C R O C
R L W H P A A I U S N C L E A S E I L R E T S E W E M U S L
P O A T W T R A S C B S T A T I O N A R Y F R O N T L S N O
R P G A O I T Y T I D I M U H E V I T A L E R D B K E F O U
I F D E L O A E R E H P S O P O R T H U N D E R S T O R M D
A E H W T N O R F M R A W E T B U L B I J G N I N T H G I L

JARGON OF THE METEOROLOGIST

- Dry Bulb
- Wet Bulb
- Dew Point
- Relative Humidity
- Air Mass
- Cold Front
- Warm Front
- Stationary Front
- Occluded Front
- Isobar
- Isotherm
- Hurricane
- Low Pressure
- Cirrus
- Tornado
- Thunderstorm
- Cumulus
- Stratus
- Cloud
- Fog
- Dust Devil
- Atmosphere
- Stratosphere
- Barometer
- Air Pressure
- Temperature
- Weather Map
- Convection
- Radiation
- Climate
- Sling Psychrometer
- Lightning
- Jet Stream
- Polar Front
- Westerlies
- Easterlies
- Trade Winds
- Doldrums
- Cyclone
- Monsoon
- Troposphere
- Cumulonimbus
- Precipitation
- Evaporation
- Rain
- Snow
- Hail
- Sleet
- Coriolis Effect
- High Pressure

JARGON OF THE CHEMIST (50 WORDS)

```
E B P L C K N O R T U E N O I X E L P M O C N U C L E U S E
L M O H M E L T I N G P O I N T H J G K I F I E S A B E N S
C N B A E U N K S A L F G N I L I O B T E S T T U B E   E O
I O D L N N I M J L A I N A D I K I A J L J R N P D T F G L
T R N O Z A O R T M H L I O L N L M Z N B K O O R S A G Y U
R T U G Y N L L B S E Y G H B K O K H O I H G I O U R D X B
A C O E M J W K P I Y L G F S R A B M G C I E T D O D E O I
P E P N E D O U A H L L E R A N A L L R U C N C U E Y T X L
A L M T A U I P V N T I A M E P G C I A R L M A C U H A I I
T E O P S B V C R F E H U T E N Q E M L C B N E T Q O R O T
E L C I T R A P A H P L A Q A N E R U T X I M R S A B D A Y
B A V A G A D R O P G O E L E C T R O C H E M I S T R Y T U
G T W K S A L F R E Y E M N E L R E C F A B A E O B A H I P
A O S E R C E L B A T C I D O I R E P R O T O N H V C T O S
F M D U N Q D R E N R U B N E S N U B D E R O T A C I D N I
B T O B O I L I N G P O I N T B W N O I T C A E R E L A H R
D R E D U C T I O N A F E L G N A I R T Y A L C A D C B O D
C V T R E U W E N E V O G N I Y R D O R E Z E T U L O S B A
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JARGON OF THE CHEMIST

Absolute Zero
Acid
Base
Aqueous
Oxygen
Nitrogen
Carbon
Periodic Table
Alkali
Atom
Proton
Neutron
Drying Oven
Hydrated
Electron
Nucleus
Alkane
Boiling Point
Melting Point
Alpha Particle
Beta Particle
Argon
Aromatic
Chemical Bond
Test Tube

Bunsen Burner
Boiling Flask
Carbohydrate
Solubility
Equilibrium
Oxidation
Reduction
Halogen
Reaction
Products
Element
Compound
Mixture
Half Reaction
Electrochemistry
Avagadro
Enzyme
Catalyst
Energy
Phenolphthalein
Indicator
Comples Ion
Crucible
Erlenmeyer Flask
Clay Triangle

CAREERS IN AGRI-BUSINESS (60 WORDS)

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S E R I C U L T U R I S T J O I A K F L G H B M L P T J O C
O M C V U R E G N A R K R A P Z R E T S E T S L I O S V A K
I V F I S H F A R M E R T S R E E N I G N E G N I N I M U N
L A B O R A T O R Y T E C H N I C I A N R   E L W O R C O I
C B D R O T A N I C C A V Y R T L U O P M R O P D E A B K T
O U S E I S M O G R A P H M A N Y N F S F M X D P N H T M S
N A L D W V T A G H G A T S I N A T O B C I M O N O C E L I
S U M A R K E T A N A L Y S T O X L A T S I M O N O R G A C
E T I R D S K E R H F W L P K W E E D I N S P E C T O R K I
R A N G E C O N S E R V A T I O N I S T H G O O J I P I J T
V G E T E C O B Q B J X N S S O I L S C I E N T I S T N R E
A R S A D O F J A I W O D I B D A I R Y M A N P N O H O S N
T I U E F N L C O P H D S L V L U T S I N O I T I R T U N E
I C P M E S O O P I C A C A T A N A M E R O F E N I M T L G
O V E R I E R H G Z O I A I R N T S V R U M O R D G R O X H
N L R K J R I Q D I C R P C E D I A G N I R E E N I G N E R
I T I R S V C C M B S Y E E E C A N S W O P B W L G E F C O
S U N H R A U I N D E T A P S O F Q V N P A K C E D U C I T
T R T L E T L N A N M E R S U N R A P A J V T R B A O E V C
W A E T H I T A E T U S C E R S H O R S E B R E E D E R R E
S L N U C O U H P V O T H F G E N T O M O L O G I S T F E R
G E D B A N R C N T W E I I E R T S M I E U P A W V G D S I
R C E N E A I E E S B R T L O V E H R E M R A F E M A G N D
T O N A T I S M D I I E E D N A L O S R O Y E V R U S H O H
S N T I G D T R R M O P C L G T S I G O L O O Z J W I C I C
Y O A R A E F O A E L E T I K I C H T H Y O L O G I S T S R
L M F A O Q X T W H O E G W F O Q N P A M D C D X K B A N A
A I D N V G C C E C G K F D A N I M A L B R E E D E R K E E
N S E I H R E A M O I E H N E I T S I C I S Y H P O I B T S
A T U R K E Y R A I S E R A M S C D C L N B O N R A M L X E
D I S E I J U T G B T B W H I T E C H N I C A L W R I T E R
E F J T C G K D B V E L X S J Y B T S I R U T L U C I P A F
E H B E T R O T A G I R R I Z D A D K T U O K O O L E R I F
S D C V C B R E T S E R O F O R E S T E C O L O G I S T G E
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CAREERS IN AGRI-BUSINESS

Soil conservationist
Range conservationist
Soil scientist
Agriculture engineer
Agronomist
Biologist
Woodland conservationist
Geologist
Agricultural economist
Conservation aide
Engineering aide
County agricultural agent
Extension service
Vo Ag Teacher
Biochemist
Biophysicist
Economic botanist
Plant ecologist
Plant taxonomist
Dairy technologist
Agricultural engineer
Entomologist
Apiculturist
Sericulturist
Geneticist
Animal breeder
Plant breeder
Horticulturist
Floriculturist
Market analyst
Nutritionist
Pathologist
Physiologist
Research Director
Soil scientist
Zoologist
Animal ecologist
Animal taxonomist
Ichthyologist
Agricultural aide
Biological aide
Forester
Forest ecologist
Forester aide
Fire lookout
Forest fire fighter
Logging contractor
Logger
Mining engineer
Surveyor

Technical writer
Park ranger
Park naturalist
Park superintendent
Park worker
Hydrological engineer
Irrigation engineer
Fish and wildlife specialist
Game farmer
Fish farmer
Gamekeeper
Game warden
Trapper
Predatory animal hunter
Bird trapper
Mine superintendent
Coal inspector
Mine foreman
Petroleum engineer
Geophysicist
Seismograph man
Poultryman
Poultry breeder
Turkey raiser
Dairyman
Orcharist
Farmer
Cattle rancher
Beekeeper
Horse breeder
Tree surgeon
Animal caretaker
Irrigator
Meat grinder
Dairy tester
Hatchery manager
Poultry technician
Chicken sexer
Poultry vaccinator
Artificial inseminator
Veterinarian
Laboratory technician
Tractor mechnic
Seed analyst
Orchard fumigator
Weed inspector
Landscape architect
Soils tester
Landscape gardener
Editor

JARGON OF THE ASTRONOMER (50 WORDS)

B I G D I P P E R Y A N F O S P B H W G E F S C O R P I O E
L M C S B S U R U A T T L T I L Q H K N J O F K J M E N I D
I O K O L C N U T E M I A S A R I A U C L F I C C P N F P O
T O L R N O E M D U P R V C S T E T B A O R O O R E M L R C
T N J L V S C P R E A O K I E C P D R T U M P A Q A C E O G
L W V N O V T E O T S H C D T E D S F T E E T L S S T A M B
E B I O O P T E S C O R W S N A Y I N T R S R T O L N E P H
D P R W E I A Y L L S A E R E S L E R N N Q E L I H R V R S
I X G I P R R N E L R O U V T L C E I O S R A F T C U E U K
P A O U X A A O T F A T R E I A E C R E O R V I U X C N W M
P D J P N H R L N I A T M T H N U T F I W E Y R Z O S G A P
E B O I R B A I F S M C I P C S U E D I N J Y A V P W U J L
R A B A I S E T B R R A L O D E G J N U B F C E O D L R E U
T U L T C T R P G U A A T V N H P D S L K M R T F V F A E T
C I S U S G E M I N I L M T I N I S N A O Y X A L A G N I O
S G W N B M L F Q K O P O J E O R K E P L E R U J U A U D E
X D I E B E M U R T C E P S O R M N P S I A T G H G H S K C
H E A N C F N E O G B P H M E T E O R O R L S F T D B G H K

JARGON OF THE ASTRONOMER

Universe
Space
Moon
Apollo
Liftoff
Orbit
Recovery
Telescope
Star
Comet
Meteor
Alpha Centuri
Solar System
Mercury
Venus
Mars
Jupiter
Saturn
Uranus
Neptune
Pluto
Spectroscope
Orion
Asteroid
Nebula

Constellation
Big Dipper
Little Dipper
Sun
Sunspot
Solar Flare
Solar Wind
Relativity
Einstein
Filter
Spectrum
Taurus
Gemini
Virgo
Antimatter
Black Hole
Neutron Star
White Dwarf
Binary Star
Crater
Kepler
Copernicus
Galaxy
Scorpio
Leo

ELECTRONIC TERMS
USED BY AN ELECTRONICS TECHNICIAN (40 WORDS)

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A Q C R E Z D E O Y S D C S B X P Q W F S E C N A I L P P A
N L A X D F W I F E I E G C R H D R E I F I L P M A S G V I
T P T G S C D D H A M T D I R O Q E S U G R T U M P U R R R
E H H E F A L V K U J B A O J S Q O V I E T O T E F M E Q C
N O O N R E S I S T O R S T I R L S F T N O N C T T L T D R
N I D F E N B C R A T S W S N D R H E P W E O N E E M E N A
A S E C Q M A I O X T A B S E R E M H I R M W V R P E M U F
J N R O U G U T T U W T C R Q M T J G R P G S A P D L M O T
N O A R E Y T I I E R I W L D L K Q U U R O W C V U K H R J
K I Y E N V O Z C N S T P C O M L C T F X F D H K E L O G S
M S T M C W M E A O G R E V P O T E Y Z N C Y B I J T S T E
T I U R Y H O N P B A C O L P C R K A S R E T E M A H N E V
L V B O N N B S A S O B U T E S C L C B M K L J L W E I K A
U E E F I Z I B C R I B Q R S V Z I A O L A X L B M V A H W
L L M S S S L A V A U G I A R I I Z D N L M I I U O K E J E
V E J N X O E N W K R D X N Y E S S N E G C C R O T U B G R
B T W A Y I S D X T A G H Z O P N N I A S I T H E O L O I A
W K X R T D C U Z F D Y I S E B U T A O D S S P S R T R F U
X A Z T Y A D Y E S A J S I S S A H C R N Q F R U S M P H Q
S O L D E R I N G I R O N C Q E R B F I T S G D F S G E N S
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ELECTRONIC TERMS (40 WORDS)

soldering iron
voltmeter
ohmmeter
resistors
tubes
frequency
amplifier
televisions
applicances
radar
aircraft
meters
antenna
signal
chassis
alternating current
sine wave
pulse
oscillator
probe

solder
ammeter
wire
capacitors
transistors
transformer
diodes
radio
computers
instruments
automobiles
Ham
ground
motors
fuse
direct current
square wave
clock
Citizens Band
cathode ray tube

5

JARGON OF THE BIOLOGIST (50 WORDS)

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D L E O N E K P L D B J U M W C R X T S C T U S D C T O N D
K E L F L S T A G E P O C S O R C I M A M M A L R S Y S P R
G A O S M O S I S L I V M D I A P H R A G M Y E N P R M H D
O K U X J Q V N L R E T A R B E T R E V R E Q Q I E A N E T
A E C N Y K A H S G O P M O F M N S D F M M S N E L T O N O
H Y A M D R O S O P H I L A U R O G O B E B I O T B N P Y R
I I V B A K I Z T I U P H E T E R A N S O R S I O K U F L S
A C J B J C O B J E C T I V E D U O I P L A Y T R U L G A U
M A N I B O L G O M E H D O N O E V H T H N L A P L O A L E
D F O R C E P S F N G C M N R T N M C J P E O T V K V I A L
K E I E J D E L B H U N O I T C E L E S L A R U T A N R N C
H R L M S A L P O T Y C I J O E U X I U W Z D M A Y I D I U
L T G N M S I N A G R O L Y M P H A T I C S Y S T E M N N N
O I N F H P O R T O R E T E H T H U V H W V H A I H C O E P
I L A H P E N O M R O H Z G I Y T E T A H P S O H P J H M I
G I G A S T R U L A A S G P S C I T E N E G B X J I B C B D
K Z N J B D I S S E C T I N G P A N E P H R O N N K O O R O
G A L A P A G O S L Q R K F W S X C H R O M O S O M E T Y P
O T I G M R Q L F M G L Y C O L Y S I S A D I G E S T I O N
F I S R E C E P T O R V E H V K R L J D I O L O G N O M E G
T O P E U D O L O M E M I L S Q O V U L A T I O N G C F H N
C N D I T U L O V E N Z Y M E S D E M E D I T P E P Y L O P
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JARGON OF THE BIOLOGIST

Nucleus
Cytoplasm
Organism
Microscope
Objective
Stage
Forceps
Dissecting Pan
Deoxyribonucleic Acid
Diaphragm
Digestion
Drosophila
Vacuole
X Chromosome
Echinoderm
Vertebrate
Mammal
Neuron
Ectoderm
Embryo
Evolution
Enzymes
Fertilization
Galapagos
Ganglion
Gastrula
Mutation
Genetics
Glycolysis
Hemoglobin
Heterotroph
Hormone
Hydrolysis
Leakey
Lymphatic System
Membrane
Mitochondria
Mongoloid
Involuntary
Natural Selection
Nephron
Osmosis
Ovulation
Phloem
Phenylanlanine
Phosphate
Protein
Polypeptide
Receptor
Slime Mold

JARGON OF THE ECOLOGIST (50 WORDS)

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B H N A P S E F I L C P C N O I T A L U P O P R E D I T O R
E F O I H A L G A B L O O M M B N I A H C D O O F T P R E Y
H K Y E O D E K Q L D G N I X I F N E G O R T I N W N Y M R
C C F S T H E R M O C L I N E F O O D W E B V E L O T R A O
I O G U O N G F C G M U I T N O R T S M K O M W I I X A V T
N L D O S A P R O P H Y T E R I S A I T X N U T N T U M Z I
G C I R Y I F H N M R E H D N C J Y S B O L A U A C Y I R R
S L M E N R E R S B I O S P H E R E O R B R M T A N T R E R
U A A F T P C E U B P L D Z E I Z D I C G M I K S I N P S E
C C R I H O N V M O F A E U Y N J V B I O B O Z O T C R O T
C I Y N E L E O E P O C K D C H N J M C A B V T R S I A P E
E G P O S L G N O I T U L O V E G R Y H P T Y U A N M I M M
S O D C I U R R R Q U R E X S D R K S B S A I Q A I E R O P
S L O L S T E U R T F L A V I V R U S U O U D I C E D I C E
I O O I S I V T V C O L O R A T I O N O I T A L O S I E E R
O I F M G O N G T I W A J N O I T A I D A R E V I T P A D A
N B K A H N O I T C U D O R P E R A N G E N O T O C E X P T
J I H X A I C O E X I S T E N C E T I S A R A P N B I O M E
A L H M O J I E L C Y C E F I L B K C D U C L E M F V O G W
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JARGON OF THE ECOLOGIST

Range
Adaptive Radiation
Air Pollution
Convergence
Community
Nitrogen Fixing
Reproduction
Environment
Evolution
Symbiosis
Migration
Climax
Prey
Survival
Succession
Coloration
Coniferous
Biome
Deciduous
Diatom
Alga Bloom
Epidemic
Ecotone
Habitat
Niche

Instinct
Life Span
Life Cycle
Food Web
Food Chain
Primary
Producer
Consumer
Decomposer
Saprophyte
Territory
Temperate
Population
Strontium
Prairie
Biosphere
Parasite
Thermocline
Turnover
Photosynthesis
Biological Clock
Isolation
Food Pyramid
Coexistence
Preditor

JARGON OF THE PHYSICIAN (50 WORDS)

B H N I B O L G O M E H A O C O N G E N I T A L H C H Z R I
I Z O C E S O P H A G U S E S U R G E O N B O B Y A O P S O
A H I B N R J C D P L C U F I E P O G V B R R R P S J X T Y
E I T E C G Y E K A D E T N S T A C T I E F T E D R O A N G
P P A N E F P T X N N F U E O I D N A T C U A D K W E L A N
O P C E P N Y H H C O M R N B B L O S A I E E B E O E L L I
C O I R H I F O E R L R E I M T Z E I M T N N L N U R E P L
S C D G A L S R K E O E M E O S L K C I O I R O C D U R S U
O R N N L L O A O A C M W D R O Y C K N I H O O A V T G N B
T A I A O I G X R S M A Y O H R A O L L B C C D R C A Y A O
O T A G G C T G T N V L N C T F I H E V I Y M C O B M E R L
H I R S R I A M S A L P F C I X M S C K T R B E T A E D T G
U C T A A N E U R Y S M W X E N E W E E N T A L I U R S I A
O I N G M E H V K E G A C B I R N J L Z A S C L D N P I B M
K N O R H P E N I E S O C U L G A L L B L A D D E R J T I M
Y I C E R E B E L L U M U N E D O U D I C A C I R U T F A A
R G J H C E N T R I F U G E B U T L A I H C N O R B S G U G

JARGON OF THE PHYSICIAN

Anemia
Sickle Cell
Aneurysm
Antibiotic
Allergy
Strychnine
Lysol
Bronchial Tube
Colon
Duodenum
Pancreas
Gallbladder
Vitamin
Penicillin
Aorta
Caroted
Thorax
Red Blood Cell
Leucocyte
Cholesterol
Uric Acid
Glucose
Hemoglobin
Burn
Frostbite

Centrifuge
Cerebellum
Codeine
Contraindication
Congenital
Thrombosis
Stroke
Cancer
Cornea
Encephalogram
Esophagus
Erythromycin
Gamma Globulin
Gas Gangrene
Transplant
Suture
Surgeon
Shock
Premature
Plasma
Otoscope
Hippocratic
Nephron
Rib Cage
Tibia

CAREERS IN MARINE SCIENCE (31 WORDS)

```
H B V S Q U P T X G W T S I G O L O R O E T E M E N I R A M
S P E A R F I S H E R M A N U E N F M T S C N A S M F M R E
K N I L R O L I A S V O N V M A H L R I G O F R H E L O D D
I A R L T J F V T F W T W O C I J T E R L M W I V G V T W O
N M D I V E R Y C O H O P X K S H P E F O P U N K J K O C I
D R O G F U O G H T X R L Q D I Y J N I X U I E H V B R C O
I E W A R D G R E S Q B U N O K D Y I S Q T G G J J U B P N
V H E T P Y F E R Y M O R A C Z R S G H R E Q E X P O O H A
E S K O D S A S Y L R A T M K T O K N E P R W O I U Z A B U
R I E R V O R N M A S T N A M E G D E R D M A L C Y G T M T
L F N F T U M T A N Q M L E A Y R N E Y T A H O F T L O F S
C E A A O Z E F N A W E C S S D A E N B X N X G T S K P I I
P N M R F G R P M L B C R X T M P S I A Y A G I A I T E S G
M I S M H U E D V A J H F B E H H Z R C Z G N S S N J R H O
X L T E O N K A C C E A B L R A E Y A T W E F T I I R A C L
N Y F R D J Q L K I K N A I Z F R G M E O R M Q L H S T U O
G N A E M Z P J Z M B I T S I G O L O R D Y H E H C G O L I
M H R C O X W D V E U C D I V I N G F I S H E R M A N R T B
C N D Y Z D E C K H A N D T D E S I R O C H D Q Z M E F U C
Z I E Y Q F E I H C Y R O T A R O B A L X G P Y K A R J R I
B Y N D V Z U X C W R A U C L D K J W O B A K B H I D K I T
L O I W A A Y S B B C H M V R E W O R G H S I F L L E H S A
M A R I N E A R C H I T E C T N V A D I L C J G P O B C T U
A O A P W T V R B S F T G U O E   A E S O I E J F A L C M Q
X Z M A R I N E G E O P H Y S I C I S T N F I M P D B N O A
```

CAREERS IN MARINE SCIENCE

Aquatic Biologist
Marine Geophysicist
Marine Geologist
Marine Meteorologist
Hydrographer
Hydrologist
Clam Dredgeman
Line Fisherman
Spear Fisherman
Diving Fisherman
Fishery Bacteriologist
Fish Culturist
Hatchery Man
Alligator Farmer
Frog Farmer
Shellfish Grower
Marine Architect
Marine Engineer
Marine Draftsman
Skin Diver
Diver
Motorboat Mechanic
Motorboat Operator
Dockmaster
Machinist
Seamen
Sailor
Deckhand
Chemical Analyst
Laboratory Chief
Computer Manager

CAREERS IN SCIENCE (36 WORDS)

```
D C K P O C J O N E B I A B A C T E R I O L O G I S T I K E
R D Q A B N B B F A D S H C G H A Z E X H I C E L H L F G J
O M D L A C M D I E T I T I A N K Y I K H X G O G F T M K I
T P C E R N A M E R I F M L F Z J Z W J Y E D L H M S E D F
C F Y L R E D R O M N G L I K J Y T S I N A T O B L I T J H
E Z G N H D X N A I R A N I F E T E V F W G E G E G P E E E
P N F Y E Z O O L O G I S T B O A Z N X B V M I S U A O T D
S A R Q G M T S I P A R E H T L A C I S Y H P S R C R E C I
N I E O E R I H R E J A P K T S I N O I T I R T U N E O S A
I C G R A D I O L O G I S T P Y V X P F W N A C N D H L D H
G I N Q T O S L Z N T S I G O L O H T A P A C V D B T O F T
U S A P M U Q I O T M T S I M E H C O I B I T B E T N G B L
R Y R R P S V N Y W X L O U W T S I M E H C I U R D O I S A
D H T O Q K J T R E H P A R G O N A E C O I C A E E I S Q E
D P S P S N U R S E Y M A N V H P G T F Z R A P T N T T Z H
N M E D I C A L A S S I S T A N T W R Y Q T L T S T A O R L
A G R O N O M I S T J U O I W V H X I G E C N F I I L X A A
D T O S R A R K T S I R T A I H C Y S P I E U S G S A N Q T
O B F M U Q L S U T P H Y S I C I S T D R L R J E T H Z Y N
O P H A R M A C I S T T V N A M E C I V R E S U R K N L N E
F C V S W U R E E N I G N E L A C I N A H C E M V A I W M M
X R N F O O D P R O C E S S I N G T E C H N I C I A N P O Y
```

CAREERS IN SCIENCE

Astronomer
Bacteriologist
Botanist
Biochemist
Chemist
Dentist
Dietician
Electrician
Fireman
Food Processing Technician
Geologist
Inhalation Therapist
Practical Nurse
Mechanical Engineer
Mental Health Aide
Medical Assistant
Meteorologist
Optometrist
Oceanographer
Pharmacist
Physicist
Pathologist
Physical Therapist
Physician
Psychiatrist
Radiologist
Registered Nurse
Nurseryman
Zoologist
Veterinarian
Agronomist
Nutritionist
Orderly
Food and Drug Inspector
Serviceman
Forest Ranger
Soil Conservationist
X-Ray Technologist

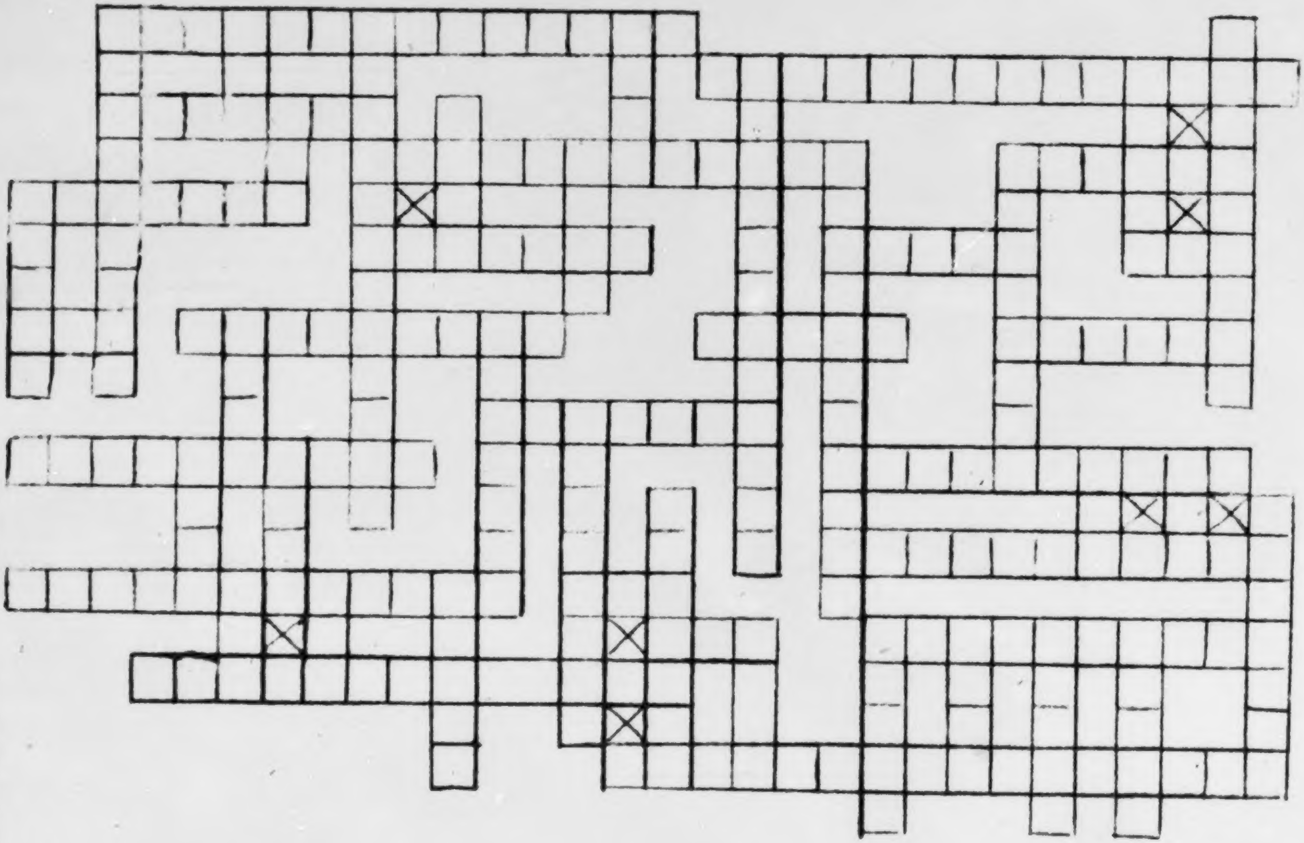
CAREERS IN PERSONAL SERVICES (50 WORDS)

D N U R S E R Y S C H O O L A T T E N D A N T N J K R L K R
J O I B O N S H M O O R S O B C R T S P O T O D I E D M E E
R K G M U S O H P G O S P P A A S S E R S P I J L H R W N D
U C K P H T I N O O R N M T T I B T T I T A K B I G E I N U
E R L L O N L V O E R E E E R S S Y G U D L M F O A S N E C
S E J I U U S E R S R R K A T H S O S N V E M N V P S E L I
S M R M S R N I R E E E V A O O L E I I S V E E H O M S M N
A A E H E S J D L R P O P P T O L L D S T V R H R R A T A G
M T P R K E A R A K A U A A R E B O A R W W D O E N K E N S
R O E E E M N E F T F T S T I L R D G X A C S R T A E W T A
E R E O E A I K T U T I C N   R O A Y I X W T S T M R A S L
P E K H P I T A U E E E N M E O M R C U S B E E O E E R I O
L N L S E D O B N X L Z N I F H Z A O L K T G T P R M D T N
E I A E R G R D W E Y D A D S A C Y N L A F I R S O L R R A
H A M S C H A U F F E U R B A H Z T V E I M A A H F A A A T
N R I R F N N A M E L B A T S N E W I X J A I I G Y B W O T
E T N O T D O G G R O O M E R A T R D K Y Z T N A R M E O E
H G A H F E H C E A C B R O T A N I M R E T X E A D E T T N
C O F F E E M A N D C C B C R E N A E L C G V R B N D S T D
T D R Y C L E A N E R R E N A E L C E R U T I N R U F E A A
I A K O O C R E G A N A M L E T O H N A M Y R T N A P F T N
K B U T C H E R O T A R E P O T N E M T A E R T P L A C S T

CAREERS IN PERSONAL SERVICES

- Cook
- Nursemaid
- Butler
- Baby sitter
- Chauffeur
- Housekeeper
- Hotel Manager
- Exterminator
- Janitor
- Cosmetologist
- Masseur
- Reducing Salon Attendant
- Embalmer
- Cremator
- Scalp Treatment Operator
- Tattoo Artist
- Electrologist
- Laundry Foreman
- Spotter
- Dry cleaner
- Silk finisher
- Shoe repairman
- Reweaver
- Tailor
- Coffeeman
- Pantryman
- Kitchen Helper
- Caterer
- Food Assembler
- Dressmaker
- Furniture Cleaner
- Rug Cleaner
- Blind Aide
- Nursery School Attendant
- Steward
- Stewardess
- Animal Keeper
- Horseshoer
- Animal Caretaker
- Aquarist
- Dog Groomer
- Dog Pound Attendant
- Kennelman
- Stableman
- Pet Shop Attendant
- Dog Trainer
- Horse Trainer
- Wine Steward
- Kitchen Supervisor
- Baker
- Butcher

CHKD. BY........DATE........ JOB NO. ....



CAREERS IN BIOLOGY CROSSPATCH

BY__________ DATE__________ SUBJECT__________

CHKD. BY_______ DATE_________ JOB NO.__________

```
    A N T H R O P O L O G I S T                         O
    N     A     S           T   D E N T A L H Y G E N I S T
    A N A T O M Y   M       A     N                 A   T
    T       A   C H I R O P R A C T O R       B O N N I E
F L O R I S T   H   N     O       O   A       O     N   O
L   M       O R D E R L Y     M   D I V O T     Y A P
E   I       L         E       O   I       A         A
S O S   E C O L O G I S T       B L O O D     N U G G E T
H   T     O     G     U           O   L       I         H
          M     I     R U N N I N G   O       S
B I O C H E M I S T   G   E       I   G E N E T I C I S T
        E   E   T     E   C   C   S   I           A   I   D
        A   A         O   R   U   T   S C H O O L N U R S E
V E T E R I N A R I A N   O A R       T                   N
          N   N     L     S   A S P     P O D I A T R I S T
      O R N I T H O L O G I S T   R     O   E   T   O     I
                    O     S   O   A     A   A   O   U     S
                    W       X R A Y T E C H N O L O G I S T
                                        H       L   E
```

CAREERS IN BIOLOGY
CROSSPATCH ANSWER

CAREERS IN BIOLOGY CROSSPATCH

*refers to Biology careers

3 letter words

oar
SOS
inn
cat
yap
can
ant
hat
sir

4 letters

mind
star
mean
Dean
come
pole
hear

5 letters

allow
flesh
divot
poach
blood
rouge

6 letters

Bonnie
nugget

7 letters

*orderly
*surgeon
anatomy
running
*curator
*dentist
*florist

8 letters

necrosis
*botanist

9 letters

*anatomist
*ecologist
*osteopath

10 letters

*biochemist
*geneticist
*podiatrist

11 letters

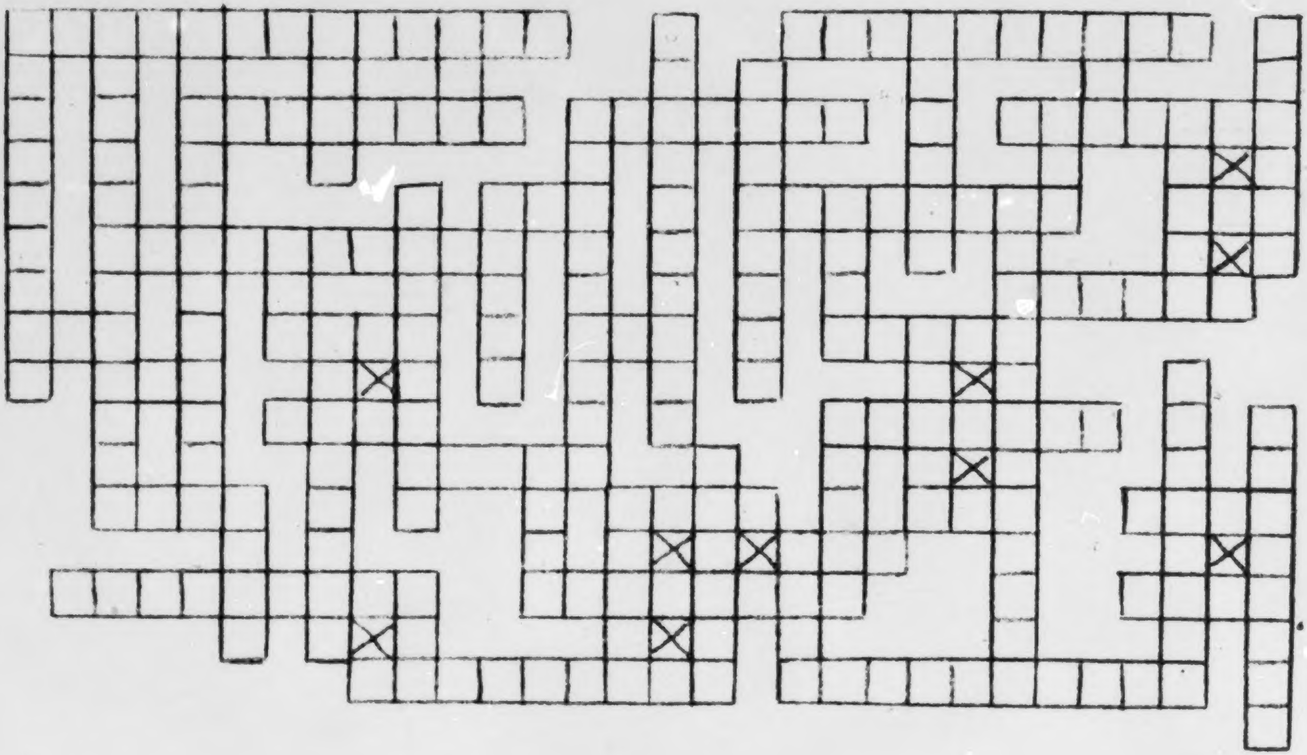
*school nurse
*radiologist

12 or more letters

*anthropologist
*chiropractor
*veterinarian
*X-Ray technologist
*ornithologist
*dental hygenist
*entomologist
*psychologist

BY____________DATE________ SUBJECT______________________________ SHEET NO._______OF_____

CHKD. BY______DATE________ JOB NO.__________________



JARGON OF A GEOLOGIST CROSSPATCH

BY ________ DATE ________ SUBJECT ____________________ SHEET NO. ______ OF ______
CHKD. BY ______ DATE ________ JOB NO. ______________

```
C A R B O N I F E R O U S     M     A N T H R A C I T E   C
A   E   R     A     A         O   P       A       L       A
R   J   T E R T I A R Y   I G N E O U S   L   S I L I C O N
B   U   H     E           N   O   R       I     N     U   Y
O   V   O         H   B E T   C   O B S I D I A N     B O O
N   E A R T H Q U A K E   R   L   S   O   E   R       I   N
A   N   H   I     R   A   U   I   I   A       T R E N C H
T E A   O   S A N D   C   S I N   T   R I D G E
E   T O M     L   N   H   I   I   Y       R   S       C
    I   B   M U T E       V   C       E R O S I O N   E   S
    O   I     M   S K A T E     F     S   V   A       N   I
    N I C K   I   S     U   F R O M   K   E O N     S O I L
          I   N         F   E   S   P E N     W       Z   U
  D I N O S A U R S     F E L D S P A R       E     B O A R
          S   M   E         O   I   T         L       I   I
                H E X A G O N A L   H Y D R O L O G I C   A
                                                          N
```

JARGON OF A GEOLOGIST
CROSSPATCH ANSWER

JARGON OF A GEOLOGIST CROSSPATCH

*refers to geology

3 letter words

*eon
sin
Tom
ill
see
pen
bet
boo
tea
inn
oar
his

4 letters

*sand
*tuff
kiss
fate
mute
boar
*soil
from
path
soar
Nick

5 letters

*cubic
*esker
drove
skate
*beach
*ridge
felon

6 letters

*fossil
*halide
*canyon
*trench

7 letters

*igneous
*silicon
*erosion

8 letters

*porosity
*feldspar
*obsidian
*aluminum
*hardness
*cenozoic
*tertiary

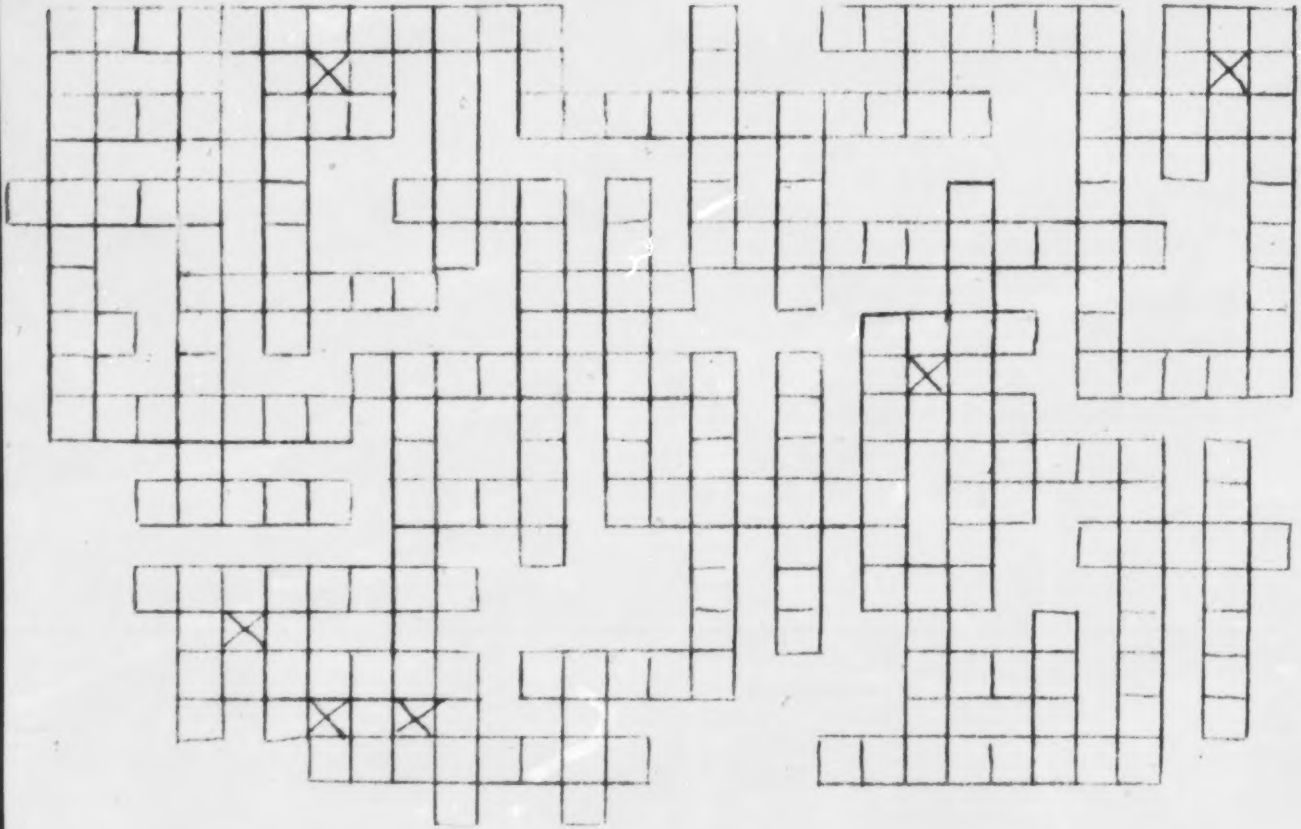
9 letters

*carbonate
*intrusive
*hexagonal

10 or more letters

*carboniferous
*monoclinic
*rejuvenation
*earthquake
*anthracite
*orthorhombic
*artesian well
*hydrologic

BY________ DATE________ SUBJECT________________________ SHEET NO.______ OF______
CHKD. BY______ DATE________ ________________________ JOB NO.______________



PSYCHOLOGY JARGON CROSSPATCH

BY____________DATE________ SUBJECT__________________________________ SHEET NO.________OF______

HKD. BY_______DATE________ JOB NO.__________________

```
  I N T E L L I G E N C E       P     H O R M O N E   M A T
  M     X   O   S   O   S       H         A       N   O   H
  P E E P   B A R   R   P E R S O N A L I T Y     C O L O R
  R     E G O       M           B   L             O   E   E
T I M E R   T     M A Z E   H   I   P       P     U       S
  N     I   O       L   X   Y   A C H I E V E M E N T     H
  T     M E M O R Y     T E S T     A       R     T       O
  I D   E   Y           R   T           P A C K   E       L
  N     N       I N T R O V E R T   S   R   E     R O U N D
  G E S T A L T   E     V   R   H   K   O O P S
        A         U     E   I   Y   I   B   T A X I S   C
      B L I N D   F E A R   A D R E N A L   I T     T   O
                  O     T       O   N   E   O     P I T C H
      R E S P O N S E           X   E   M A N       M   H
        A   C     I             I   R     E     A   U   L
        S Y N A P S E   B R A I N         S E A M   L   E
        Y   S   O   D     O               O     E   U   A
              A P T I T U D E         H Y P N O S I S
                    T     S
```

PSYCHOLOGY JARGON CROSSPATCH

ANSWER

PSYCHOLOGY JARGON CROSSPATCH

*refer to psychology

2 letter words

it
*id

3 letters

mat
pop
rat
*GSR
*ego
sat
bar
man
*ESP

4 letters

mole
rear
seam
pack
*maze
*Ames
*pons
cops
peep
edit
easy
*test
*rods

5 letters

*timer
round
*alpha
*blind
*taxis
Aesop
*color
*pitch
*brain

6 letters

*memory
*normal
*phobia

7 letters

*adrenal
*problem
*cochlea
*Skinner
*synapse
*gestalt

8 letters

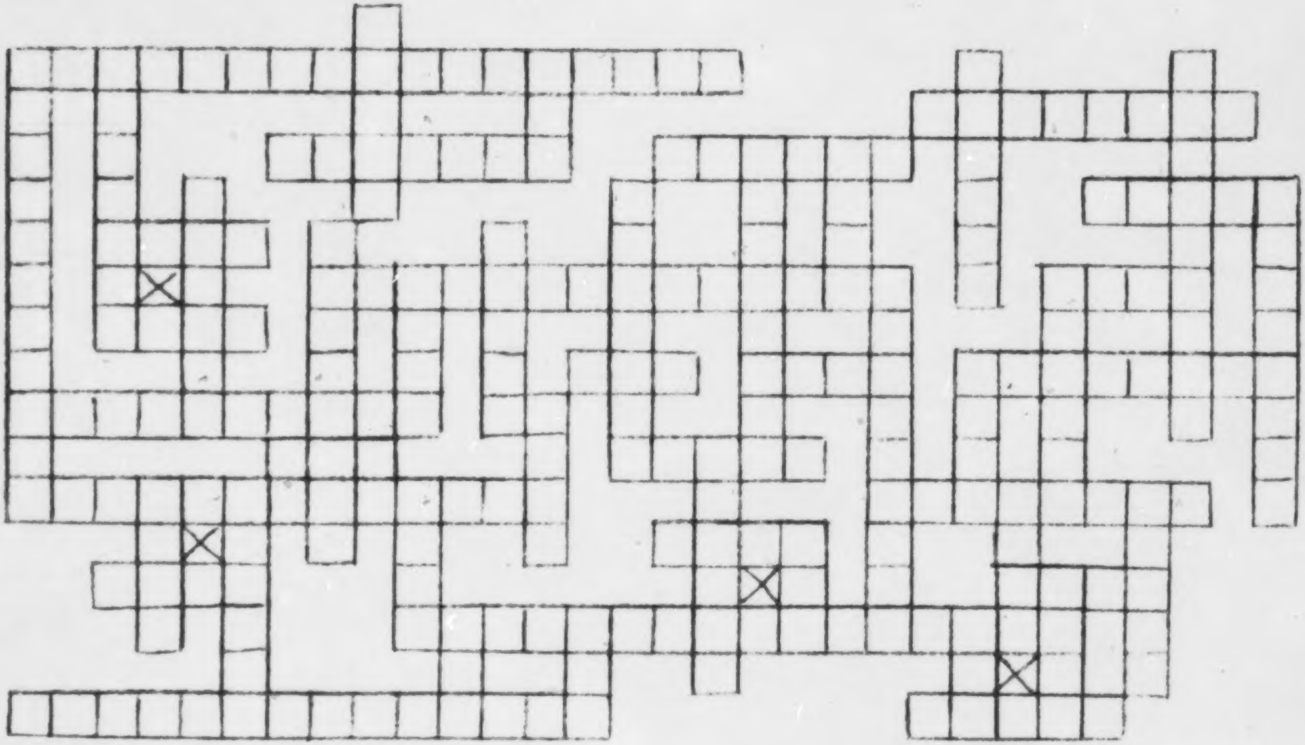
*lobotomy
*neurosis
*hypnosis
*hysteria
*stimulus
*response
*thyroxin

9 or more letters

*threshold
*intelligence
*perception
*imprinting
*experimental
*introvert
*achievement
*aptitude
*personality
*encounter
*extrovert

BY____________DATE________ SUBJECT____________________________________ SHEET NO.________OF______

CHKD. BY______DATE________ ____________________________________ JOB NO.__________________



TERMS OF THE PETROLEUM INDUSTRY - CROSSPATCH

BY__________ DATE________ SUBJECT____________________ SHEET NO.______ OF____

HKD. BY______ DATE________ JOB NO.____________

```
                F
S T R A T I G R A P H I C T R A P           R         A
E   E           U       A                 G E O P H O N E
I   A       W I L D C A T     C A S I N G   F         T
S   C   F       T           D     H   O     I     B L I M P
M   T H O R   F       D     E     A   O     N         C   I
O   O   S     R O T A R Y D R I L L I N G   E   B A L L   P
G   R O S E   A   H   A     R     E     E       E     I   E
R       I     C   E   K   O I L   O N T O   T E R M I N A L
A L K Y L A T I O N   E G   C     I     L   A   R     E   I
P           H O W       O   K N O L L   O   P   E         N
H Y D R O G E N A T I O N       C       G A S O L I N E   E
      O   R   S   U     E     S T E A M I     N     Y
    A C N E       R             A   N   S     C O O L
      K   A       F R A C T I O N I N G T O W E R   O
          S         A     O     E           A   A   N
P O L Y M E R I Z A T I O N               E X A L T
```

TERMS OF THE PETROLEUM
INDUSTRY CROSSPATCH - ANSWER

TERMS OF THE PETROLEUM INDUSTRY CROSSPATCH

*refers to petroleum

2 letter words

eg.

3 letters

man
rat
how
cat
*oil
ton
the
OWA
*wax

4 letters

stem
oral
cool
acne
Thor
noon
once
*rock
gone
onto
then
rose
bill
turf
tops

5 letters

exalt
blimp
knoll
*nylon
*fault
*Drake

6 letters

*casing
*grease
*octane
*refine
*fossil
*barrel

7 letters

*Derrick
*reactor
*wildcat

8 letters

*pipeline
*gasoline
*terminal
*shale oil
*geophone

9 or more letters

*geologist
*anticline
*seisograph
*polymerization
*rotary drilling
*fraction
*alkylation
*fractioning tower
*hydrogenation
*stratigraphic trap

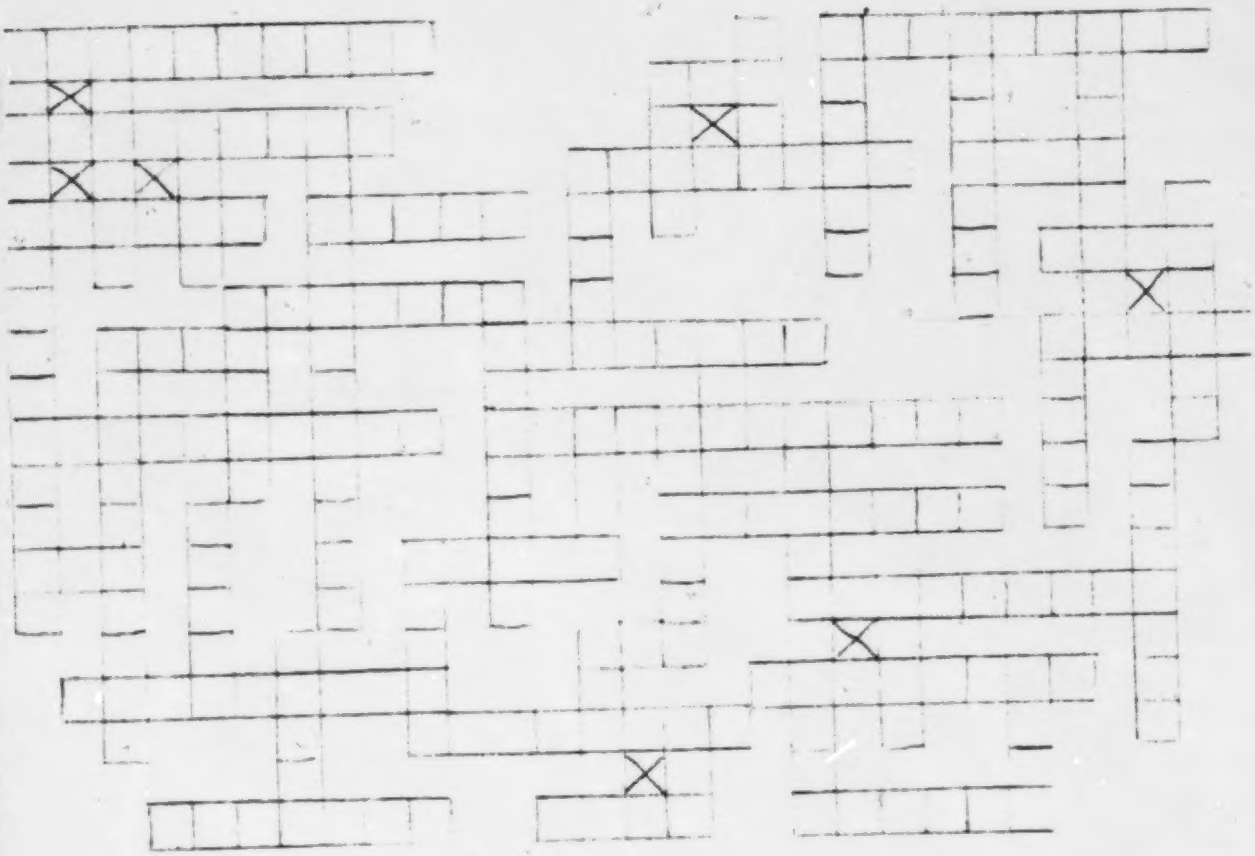
BY.................DATE..........

CHKD. BY........DATE..........

SUBJECT..

SHEET NO...........OF..

JOB NO.................



PHYSICS JARGON CROSSPATCH

BY............DATE......... SUBJECT....................................... SHEET NO.........OF...
CHKD. BY.......DATE......... JOB NO...............

```
T R A J E C T O R Y               W   F R E Q U E N C Y
H   M                           S E A   U     U     E
E M P I R I C A L               A   V   S     A     U
R   E   A     C           M A G N E T I C   N E A T
M I R A G E   C O L O R   O   E       O     T     R   H
O   E   E     E           T           N     U   W I N E
D         C E L S I U S   O                 M     N   L
Y   A C L U   E       P A R A B O L A           S O L I D
N   N     R   R       E         A               O     U
A F T E R I M A G E   C O N S E R V A T I O N   U     M
M   I     E   T       T   E   N     B           N   K
I   P   P     I       R   E   E I N S T E I N   D   I
C A R   H     O   F L U I D   R     O               N
S   O   A     N   I   M       G     R E S O N A N C E
    T   S   A     E       F L Y     P   O           T
  P O T E N T I A L       O       A T O M B O M B   I
    N       O     D E F O R E S T   I   E     O     C
            M             C   A     O         O
      F I S S I O N   H E A T     N E W T O N
```

PHYSICS JARGON CROSSPATCH

ANSWER

PHYSICS JARGON CROSSPATCH

*refer to physics

3 Letters

car
sat
sea
oar
fly

4 letters

moon
rage
sage
ACLU
some

neat
wine
need
*wave
*heat

5 letters

*atoms
*Curie
*force
*solid
*color

*sound
*field
*fluid
*motor
*phase

6 letters

*ampere
*mirage
*helium
*Newton
*fusion
*energy

7 letters

*Celsius
*fission
*kinetic
*quantum

8 letters

*atom bomb
*DeForest
*Einstein
*magnetic
*neutrino
*parabola
*spectrum

9 or more letters

*frequency
*potential
*resonance
*trajectory
*conservation
*thermodynamics

*absorption
*acceleration
*afterimage
*antiproton
*empirical

CAREERS IN BIOLOGY

Animal trainer
Antomist
Anthropologist
Bacteriologist
Biochemist
Botanist
Chiropractor
Curator
Dental Hygenist
Dentist
Bietition
Entomologist
Florist
Ecologist
Geneticist
Medical Assistant
Medical Laboratory Assistant
Medical Technologist
Nurse
Practical Nurse
School Nurse
Nuclear Medical Technologist
Orderly
Ornithologist
Osteopath
Pathologist
Podiatrist
Psychologist
Radiologist
Surgeon
Veterinarian
X-Ray Technologist
Zoologist

CAREERS IN ELECTRONICS

Electrical Engineer
Radio Engineer
Telephone Engineer
Power Plant Engineer
Electronics Technician
Plater
Electric Motor Assembler
Electric Motor Repairman
Radio Assembler
Radio Repairman
Radio Assembler
Television Repairman
Lamb Inspector
Appliance Repairman
Heating Element Winder
Line Inspector
Cable Repairman
Equipment Installer
Toaster Tester
Electrician
Substation Inspector
Cable Maintenance Man
Powerhouse Operator
Radar Engineer
Radar Equipment Foreman
Radar Mechanic
Station Engineer
Electronics Assembler
Radio Installer
Radio Mechanic

MACHINE TRADES CAREERS

Machinist
Tool and Die Maker
Tool Inspector
Machine Repairman
Tool and Cutter Grinder
Engine Lathe Operator
Milling Machine Operator
Drill Press Operator
Layout Man
Template Maker
Model Builder
Jig Borer Operator
Die Sinker
Metallurgist
Mechanical Engineer
Tool Designer
Heat Treater
Screw Machine Operator
Vocational Instructor
Industrial Arts Teacher
Gear Cutting Machine Operator
Draftsman
Machine Builder
Die Setter

CAREERS IN HEALTH AND MEDICINE

Accountant
Biochemist
Biomathematician
Biophsicist
Blood Bank Technologist
Computer Operator
Computer Programmer
Cytotechnologist
Dental Assistant
Dental Laboratory Technician
Dentist
Dietitian
Electrocardiograph Technician
Electroencephalograph Technician
Electronics Technician
Food and Drug Inspector
Food Service Supervisor
Food Technologist
Health Economist
Histologic Technician
Hospital Librarian
Industrial Hygienist
Inhalation Therapist
Medical Illustrator
Laboratory Technician
Manual Arts Therapist
Medical Engineer
Medical Secretary
Medical Social Worker
Music Therapist
Practical Nurse
Nurse Aide
Nuclear Medical Technologist
Nutritionist
Occupational Therapist
Optician
Optometrist
Orderly
Osteopath
Pharacist
Physical Therapist
Physician
Podiatrist
Psychiatrist
Psychologist
Public Health Administrator
Radiologist
Safety Engineer
Sanitarian
Science Writer
Speech Pathologist
Audiologist
Veterinarian
Psychiatric Aide
Psychometrist
Social Psychologist
Microbiologist
Medical Assistant
Dental Hygienist
X-Ray Technologist
Ambulance Driver
Ambulance Attendant
First Aid Attendant
Hospital Administrator
Controller
Medical Purchasing Agent
Home Health Aide
Audiometrist
Chiropractor
Speech Clinician
Contact Lens Technician

CAREERS IN DRAFTING

Chief engineer
Engineering planner
Aenonautical engineer
Automotive engineer
Ceramic engineer
Civil engineer
Electrical engineer
Electronics engineer
Mechanical engineer
Tool engineer
Chief design draftsman
Aircraft designer
Toll designer
Toy designer
Mechanical Design Checker
Engineering checker
Tool drawings checker
Aeronautical draftsman
Architectural draftsman
Electrical draftsman
Electrical draftsman
Electro-mechanisms draftsman
Blue Print Machine operator
Technical illustrator
Model maker
Technical teacher

OCCUPATIONS IN GEOLOGY

Crystallographer
Geologist
Petroleum geologist
Geomorphologist
Mineralogist
Oceanographer
Paleontologist
Paleobotanist
Petrologist
Photogeologist
Stratigrapher
Geophysicist
Geodesist
Geomagnetician
Gravity prospector
Seismic prospector
Glaciologist
Hydrologist
Seismologist
Techtonophysicist
Volcanologist
Soil engineer
Prospector
Laboratory assistant

CAREERS IN SCIENCE

Astronomer
Bacteriologist
Botanist
Biochemist
Chemist
Dentist
Dietician
Electrician
Fireman
Geologist
Inhalation therapist
Physician
Psychiatrist
Forest ranger
Orderly
Veterinarian
Zoologist
Nurseryman
Physicist
Photographer
Meteorologist
Farmer
Game warden
Mining engineer
Marine biologist
Salvage diver
Trap fisherman
Broadcast technician
Potter
Chemical engineer
Electrical engineer
Civil engineer
Entomologist
Herpetologist
Anatomist
Electronics technician
Draftsman
Architect
Welder

ENERGY RELATED JOBS OUTLOOK

(Examples from the New York Times)

Senior Foreign Resource Explorationist
Mining Engineers
Power Plant Simulation Engineers
Power Engineers
Solor Energy Researcher
Heating and Air Conditioning Engineer
Petroleum Economist
Crude Oil Guyer
Fossil Fuel Manufacturing Engineer
Nuclear Components Designer
Radiation Wastes and Water Treatment Engineer
Project Engineers in Coal Gasification
Geologist
Geophysicist
Petroleum Engineer
Construction Worker
Chemist
Petroleum Technician
Electrical Engineer
Oil Refinery Operator
Environmental Engineer
Mine Safety Inspector
Exploration Scientist
Technical Systems Analyst
Oceanographer
Meteorologist
Mathematician
Hydrologist
Electrochemist
Director of Energy Research
Test Technicians
Draftsman
Mechanical Technicians
Project Estimators
Stress Analysts
Piping Designers
Drilling Operators

CAREERS IN PHOTOGRAPHY

Commercial Photographer
Receptionist
Bookkeeper
Protrait Photographer
Photographic Helper
Photographic Finisher
Photo Checker
Photographic Gallery Manager
Motion Picture Photographer
News Photographer
Television Cameraman
Scientific Photographer
Aerial Photographer
Photomachine Operator
Camera Girl
Title Cameraman
Special Effects Cameraman
Animation Cameraman
Sports Photographer
News Photographer